

# THE SCHOOL REVIEW

A JOURNAL OF SECONDARY EDUCATION

VOLUME XIV  
NUMBER 8

OCTOBER, 1906

WHOLE  
NUMBER 138

## SOME RECENT TENDENCIES IN LATIN SYNTAX<sup>1</sup>

JOHN C. ROLFE  
University of Pennsylvania

One who has carefully examined the Latin grammars which have appeared with so great frequency during the last decade or two, and the successive editions of the older manuals, must have been impressed with the fact that Latin syntax is not standing still; and this impression is heightened if one has also followed the scientific treatises and monographs on that subject.

Yet the new views, and the new terminology that accompanies them, are surprisingly slow in making their way into the schools, or at least in establishing themselves there; and it is no uncommon thing for the college professor to hear from students fresh from preparatory schools in which the newest grammars are in use, that "*cum* with the imperfect and pluperfect tenses always takes the subjunctive," that "*antequam* and *priusquam* have in narration the same construction as *cum*," or that "*dum* meaning 'while' takes the indicative, meaning 'until' takes the subjunctive."

That the teachers themselves are conservative and dislike innovations is shown by the fact that the last edition of Harkness' *Grammar* could not for a long time displace the previous "Standard" edition, if indeed it has already done so, and that the scholarly handbook of Professors Hale and Buck is making its way but slowly, if I am correctly informed. A notable exception was Bennett's *Grammar*, which achieved rapid and lasting popularity, in spite of

<sup>1</sup> Read at the Classical Conference at Ann Arbor, Mich., March 30, 1906.

its many novelties in terminology and in the treatment of the syntax. I am inclined to attribute this, without in the least detracting from the merits of the book, to the fact that there was a real demand for a brief and concise grammar.

But even among those who used Bennett's *Grammar* his terminology was taken up but slowly, and he has been compelled to make a complete series of school textbooks to secure a completely uniform presentation of his ideas on the subject. I think I do not exaggerate when I say that I have rarely, if ever, known a freshman who could distinguish an "ablative of attendant circumstances" from an "ablative of manner," obvious as the difference really is; and though I teach freshmen who use grammars which employ that terminology, "volitive" and "jussive" are words which seldom fall upon my ear. In fact, the majority of my students, though I know that they have not, might have been brought up on the grammars of twenty years ago, so far as one may judge from their answers to questions in syntax.

I am inclined to attribute this—and my belief is strengthened by some experience in classes composed of teachers, which I have met in summer schools—to the fact that few teachers have a thorough grasp of the new grammar, and that this is due to the lack of a foundation of general grammatical knowledge.

If I am right in what I have said, a popular review of some of the new developments and tendencies in Latin syntax may not be without interest to a gathering of teachers. It may be profitable as well, for it seems to me most unfortunate that any teacher's knowledge of grammar should be derived from one or from a few books. Unless his grammatical equipment is very mechanical and stereotyped, he should be able to use any grammar after having a short time to look it through. He may prefer this or that book for use with his classes, but it should not be in the least embarrassing if he should suddenly be transferred to a school in which a different manual was in use. To one, for example, who has a general knowledge of the uses of the dative case it should make no difference whether the treatment of that case begins with the "dative of the indirect object," as is usually the case, or with the "dative of tendency or purpose," as in Hale-Buck. Still less should the varying terms "tendency," "service," or "purpose" trouble him. He may believe in one name

or the other, or in one or the other order of development, but he should be able to understand the point of view of the advocate of either.

In grammar, as in every line of work, the teacher should have two different qualifications for his work: first, a broad and thorough knowledge of the principles of Latin grammar; second, the good sense and good judgment to use this knowledge to the best advantage of the grade of students which he is called upon to instruct. The literature of the subject is so extensive that the foundation of the first must be laid in graduate work. The latter is in part the result of experience and in part a gift of the Creator. Such a teacher will not allow his pupils to acquire a mechanical mastery of rules, but will force them to think—which is above all what our students of all grades need to learn.

Those who treat Latin syntax are divided into two schools, both in this country and abroad, on two important details. There are those who base their work upon comparative grammar, and seek to trace back the uses of the cases and of the moods and tenses to one or two fundamental meanings; and those who believe that the facts of usage, as we have them in historical Latin, represent a tendency toward centralization and uniformity, and that the primitive language from which the Indo-European tongues were derived was in many respects more complex, rather than more simple, than its offspring. The latter accordingly devote their study to the Latin language itself, as it has come down to us in literature and in inscriptions, with little or no reference to pre-historic and pre-literary conditions.

The latter school is less well known to teachers, since it is not represented as yet by a school grammar. Its leading exponent in this country is Professor Morris, who has set forth his views in a noteworthy book, *On Principles and Methods in Latin Syntax* (New York and London, 1902), one of the volumes of the Yale Bicentennial Publications, as well as in a series of papers on "The Subjunctive in Plautus," in Vol. XVIII of the *American Journal of Philology*. His influence is also seen in the work of his pupils, especially that of Professor A. L. Wheeler, of Bryn Mawr, and Professor Nutting, of the University of California.

These two schools of syntacticians differ also on another fundamental point—namely, whether the treatment of Latin grammar should be functional (or logical) or formal. The difference between the two systems may be illustrated fairly well by the treatment of conditional sentences. That in most of our school grammars is functional or logical, and differs essentially in different books. As I have already discussed this subject in some detail in the *Latin Leaflet*,<sup>1</sup> I need not do so here, especially since all the current classifications, as well as my own, were torn to pieces by Professor Harrington at the last meeting of the American Philological Association, and a brand-new one set forth, which I presume will appear in the next volume of the *Proceedings*. A formal classification, based on the mood and tense of the verbs of the condition and conclusion, is given in Lane's *Grammar*, and comprises over fifty classes. Yet this is not a complete formal classification, as Professor Morris points out, since the person and number of the verbs, their meanings, the presence and absence of adverbs, and other factors, are not taken into account.

Conditional sentences also show the relation of functional and formal classification to instruction in school and college, and to the investigation of syntactical phenomena. As Professor Morris says: "A complete and detailed presentation of all the forms of conditional sentences would be intolerably long and complex as a means of making a student acquainted with the facts." On the other hand, one who proposed to make a scientific study of conditional sentences in a given author, or in a given period, would unquestionably examine and reject all the classifications of our school grammars, and, I venture to predict, Professor Harrington's as well, and base his conclusions on a formal arrangement. Furthermore, it is altogether probable that a careful study of the conditional sentence from this point of view, or a series of studies covering the period of the classical literature, would greatly aid the makers of grammars in arriving at a simple and satisfactory classification for school purposes.

On this second point of difference the lines are really not so sharply drawn as on the first. Just as the allopathic, or so-called "regular," school of physicians have been influenced by the homœopathists,

<sup>1</sup> Vol. V (1905), No. 116.



without formally acknowledging it, to the extent of substituting tablets of various kinds for the huge and nauseous doses of our forefathers, so the conservative grammarians have long since taken up some of the ideas of the newer school, and are more and more inclined to do so. I can remember when the term "subjunctive of desire," in the usage of the schoolroom at least, covered practically all the various subdivisions of the "volitive," and when we never dreamed of connecting uses in subordinate clauses with the independent subjunctive. The first step in the direction of differentiation was the introduction of the hortatory subjunctive for the use of the "subjunctive of desire" in the first person plural; and I remember how hard it was to accustom ourselves to the innovation. The divisions of the volitive are largely made on the basis of person and number or of tense, while in the fuller classification of the so-called potential subjunctive the meanings of the verbs play an important part. An interesting instance of the application of one of the principles of formal syntax to the work of beginners is the excellent suggestion of Professor Hale,<sup>1</sup> that the imperfect indicative, when first introduced into exercises for translation, should be accompanied by an adverb of past time and by a contrasting present. Many other examples might be cited, if it were necessary.

That the classification by function is not satisfactory is shown by the successive editions of our older grammars, and by our new grammars, in the multiplication of categories. In my school days we had the very simple rule that "cause, manner, and means are denoted by the ablative." It may have been mentioned somewhere in a note that the ablative of manner usually had the preposition *cum*, but, if so, we paid no attention to it, and that interesting fact came to us in due time as something of a shock. In fact, we rather ignored the constructions with prepositions, the circumstance that a given case was governed by a given preposition being quite satisfactory to us. Only quite recently is the connection of these constructions with those of the simple cases being formally recognized, and in this respect the Hale-Buck *Grammar* marks an advance. But nowadays cause, manner, and means (or instrument) each has its separate rule, and to these are added an ablative denoting

<sup>1</sup> *Classical Journal*, Vol. I, No. 1.

that in accordance with which anything is done, and an ablative of attendant circumstances. Professor Bennett feels the need of still another ablative, that of association, for which he recently presented a plea before the American Philological Association.

Another new term is the "dative of separation," a construction which certainly did not logically belong where it was formerly put, namely as a note under the dative with verbs compounded with prepositions. Some scholars object to this term, though I do not know that anyone has put his objections into printed form. There is really no more objection to the term than to that of "dative of agent" or "dative of possessor." The dative does not, of course, denote separation, but no more does it denote agency or possession. All three belong to the general category of dative of reference, and "dative of separation" is quite as accurate a designation as "dative of agent." Some grammarians prefer to speak of the "dative of the apparent agent," and in the same way we might speak of the "dative of apparent separation" or the "dative implying separation."

The additions to our terminology on the side of the moods have been no less extensive, as will be seen by the table on pp. 257 and 258 of the Hale-Buck *Grammar*. I hope I may be pardoned for saying that this classification, clear as it unquestionably is, is a strong argument against the functional system, not on account of any lack of definiteness, but because it is quite out of the question that it should receive anything like general acceptance as a whole.

The time at my disposal does not allow me to go into further detail, and it really is not necessary to do so. Any teacher of Latin is familiar with the changes in our terminology, and the additions to it, which have been made within the last few decades. This is true, I think, even of the younger teachers, as a sufficient number of innovations have been made, since they began the study of Latin, to illustrate the point fully enough.

Whether the formal treatment as a whole can be made available for school purposes, or to what extent this can be done, or what influence it may have on a modification of functional classification, can be decided only when a great amount of preliminary work has been done. In fact, these questions practically throw the whole field of Latin syntax to a series of new investigations, which have the distinct

advantage that they may be carried without a knowledge of comparative grammar. That there are not a few writers whose syntax has not been made the object of special study is shown by the list in the third volume of the *Historical Latin Grammar*. In the case of those whose works have been so studied the work has commonly been done from the functional point of view, following the model set by Dräger in his *Historische Syntax der lateinischen Sprache*. There is therefore a real demand for monographs on the syntax of various writers, as well as on particular topics in Latin grammar. It must not be supposed that formal classification is a simple and mechanical process. On the contrary, it calls for much more thought and discrimination than the assignment of various cases, moods, or tenses to the pigeon-holes provided by Dräger, where the only difficulty is the occasional doubt as to the proper receptacle to choose. The work should be preceded by a careful reading of the literature of the subject, Professor Morris' book and the writers which he cites, and a careful examination of his basis of formal classification given on p. 196.

Those of us who have been brought up with the idea that the comparative method is the only proper one of approaching questions of language and literature must feel that our foundations are cut from beneath us, if Professor Morris' views on that subject are correct. There is no question, I think, that the explanation of the Latin ablative as a combination of the functions of the locative, ablative, and instrumental of an earlier period has brought order out of chaos, and made it easier to understand the uses of that difficult case. At the same time, it must be admitted that it is impossible with certainty to assign each use of the ablative to one of these three cases. One may readily, too, concede Professor Morris' contention that certain substantives on account of their meanings must have been without certain cases. We can hardly conceive of *gladius* as having been used in the locative, and hence in all probability it never had a locative; but this does not affect the existence of a locative case. We know that the ablative was originally of a very limited range and we may admit that the locative and the instrumental too were limited by the meanings of words. If, as Professor Morris contends, the progress of language has been in the direction of simplification

and definiteness of meaning and function, as the history of the modern languages seems to show, why should we on that account throw overboard our theory of the ablative? The instrumental, as it is now understood, combines such different ideas as association, accompaniment, and instrument—thereby differing from the simplicity of the ablative and the locative, which latter would be still further simplified if it were divided into a locative and a temporal. Hence the range of meaning of words which might have originally had an instrumental case is pretty wide, including not only *telum*, *gladium*, and the like, but *servus*, *vinum* (*miscebat mella Falerno*, Hor. Sat. ii. 4. 24), *pilum* (with *ludere*), *mulo* (with *ire*, Hor. Sat. i. 6. 105), *postico* (with *jallere*, Hor. Epist. i. 5. 31), *verbis* (with *miscere*, Hor. Sat. i. 10. 20). We even have it with personal names, as in *stipare Platona Menandro* (Hor. Sat. ii. 3. 11). If we are to indulge in speculation, and to pass beyond a period represented by any Indo-European language, we might infer that the primitive language had four or five cases which are represented in Latin by the ablative. Professor Hale's statement in the *Classical Journal*, that "it came to be seen that the parent language had eight cases," seems a little rash. Gotfried Hermann asserted that six was the maximum and minimum limit of conceivable cases, to be confuted by the discovery of Sanskrit with eight. Why may not the parent language possibly have had ten or even more cases? But I suspect that this very question would be regarded by Professor Morris as showing the truth of his general principle.

I must say that I am very skeptical about the idea that all the uses of a case are derived from one fundamental meaning, or from one or two such meanings. This seems to be contradicted by what we might infer about the psychology of primitive man, by the language of some barbarous nations, and by the general facts of language. The attempt to connect the various uses of the cases, as one reads them in Bennett and Delbrück, seem more ingenious than convincing. The parallelism of building a house with a tool (instrumental) and with a slave (association or accompaniment) is not very obvious, and one's sense of logic is subjected to much severer strains than this in the effort to reach a fundamental meaning.

It is even more startling—it seems almost sacrilege—to call in

question the current belief that the Latin subjunctive is a fusion of a primitive optative and subjunctive; yet the independent development of the uses of the subjunctive and the optative in Greek and Sanskrit and Latin would not be impossible or unparalleled. A supposed phonetic law of proto-Italic was shown to have developed independently in Latin and in Osco-Umbrian by the form *sakros* in the archaic inscription recently found in the Roman Forum. How many of our theories might be overthrown by the discovery of a few more archaic inscriptions! In any case, it must be realized that the fundamental meanings attributed to the primeval subjunctive and optative are theoretical and not certain, and that there is not a little disagreement among scholars as to their nature. It seems to me that Professor Morris has made it clear that the grounds on which Professor Hale attributed a future force to the subjunctive were insufficient, and that the future force in such sentences as

Alter erit tum Tiphys, et altera quae vehat Argo  
Delectos heroas (Verg. *Ed.* 4. 34).

does not lie in the subjunctive *vehat*.

Be these things as it may, it is a question whether the Latinist cannot render better service to his fellow-Latinists, and to the comparative philologists by furnishing them material for their work, by treating the facts of the Latin language as we have them. Certainly this offers an attractive field to those of us who are interested in the problems of syntax, but whose Sanskrit is becoming moth-eaten, and our Greek as well on account of the unfortunate separation of Latin and Greek which prevails in this country. The time seems to be coming when we shall have a breed of so-called Latinists who know no Greek at all *Di meliora!*

The new views on the subject of grammar are invading the contiguous field of lexicography. Here too we may make a distinction between the influence which formal classification has had on logical, which is marked and salutary, in the greater attention to the effect of context and other external influences on the meanings of words, and a purely formal classification. The two schools seem to be much nearer together in lexicography than in grammar. Dr. Wetmore a pupil of Morris', has recently discussed this subject in a Yale doctoral dissertation, entitled *The Plan and Scope of a Vergil Lexicon*.

For special lexicons the formal classification certainly offers great advantages, though even in the case of these it may be a fair question whether the province of a special lexicon is to furnish material for syntactical work, or to illustrate the semasiological development of a writer's language. For the former purpose an index might suffice. For a general lexicon a combination of the two methods, such as is followed in the main by the *Thesaurus Linguae Latinae*—though the large number of the collaborators and the frequent changes in the staff lead to inconsistencies in many points—seems to be the best. A *reductio ad absurdum* of the formal method is seen in the voluminous article on *ad*, covering about eighty-eight pages, or more than twenty-five times the limits originally set, in which we have such subdivisions as motion *ad fundum*; *de terrae partibus*; *ad urbem, oppidum*; *ad terram*; *ad litus, ad aquam*; *ad caelum*; *ad mortuorum sedes*. However convenient such a classification may be for some purposes of reference, it cannot be said to throw any particular light on the use of *ad* itself. It is, of course, true that in a logical classification there may be differences of opinion as to where a certain form or phrase should be put, and that an individual worker may himself be in doubt as to the proper disposal of his material. For example, whether *ab Illo*, in the sentence *gens quae cremato fortis ab Illo . . . pertulit Ausonias ad urbes* (Hor. *Carm.* iv. 4. 53), is to be classed as local or as temporal is not easy to decide, and there is room for a difference of opinion. But if we take it as temporal, it is not easy to make this clear by a formal classification, since the temporal idea is contained, not in the word depending on *ab*, nor in the verb, nor in the accompanying *ad urbes*, all of which point the other way—for *ab* is used with *Illo* even in purely temporal expressions—but in *cremato*.

In lexicography as in grammar, the question can be satisfactorily settled only by a great deal of patient preliminary investigation, in which we can all do our part. It is altogether probable that the decision will be in favor of a combination of the best features of the two methods, as indeed Professor Morris states. Above all, it seems to me essential that the adherents of the two schools should not raise their convictions to the dignity of a cult, and cry *abeste, abeste, profani* to all who do not agree with them. This is rarely done by the leaders

in such movements, but is not uncommon in their over-zealous pupils. Let us be open-minded and recognize the new light that is contributed by all new theories. Let us remember, too, that our forefathers were as confident of the truth of some of their theories, which are now demonstrably false, as we are of that of the beliefs of the present day, and that their names were as great in their own day as those of the leaders of the present. Above all, let us think, and train our students to think.



## THE TWELFTH MICHIGAN CLASSICAL CONFERENCE

FRANCIS W. KELSEY  
University of Michigan

The Twelfth Michigan Classical Conference was held at the University of Michigan, in Ann Arbor, on March 29 and 30, 1906, in connection with the annual meeting of the Michigan Schoolmasters' Club. There was a large attendance.

As nearly all the papers read at the conference have been or will be printed in full in publications that are easily accessible, it seems better here to present the programme merely, with references to the place of publication of the papers, instead of the customary abstracts.

### PROGRAMME

THURSDAY MORNING, MARCH 29

Presiding Officer: F. W. Kelsey.

1. "Latin in Michigan High Schools in Ten Years, 1896 to 1905" (statistics shown by the stereopticon), Principal George R. Swain, Bay City High School.
2. Discussion of Principal Swain's paper: Principal David Mackenzie, Central High School, Detroit; Professor B. L. D'Ooge, Michigan State Normal College. (See also No. 13.)

Principal Swain's paper, and the discussions of it by Principals Mackenzie, Bliss, and Bishop, Professor D'Ooge, and Superintendent Coburn, are published in the *Proceedings of the Michigan Schoolmasters' Club*, 1906, pp. 50-67; copies of this publication may be secured by addressing Mr. LOUIS P. JOCELYN, Secretary of the Club, South Division Street, Ann Arbor, Mich.

3. "Elision in Latin Verse," Professor Albert G. Harkness, Brown University.

This paper will be published in the *School Review* for November. A fuller presentation of the results of Professor Harkness' investigations will be found in the *Transactions of the American Philological Association*, Vol. XXXVI (1905), pp. 82-110.

4. "Recent Excavations of Roman Remains in Britain: Silchester and Caerwent" (illustrated), Dr. George H. Allen, University of Cincinnati.

This paper will be published, with illustrations, in *Records of the Past* (Washington, D. C.).

5. "Roman Terra-Cotta Lamps" (illustrated), Professor Edward W. Clark, Ripon College, Wisconsin.

Published in *Records of the Past*, Vol. V (June, 1906), pp. 170-86.

6. "The 'More Ancient' Dionysia at Athens: A note on Thucyd. ii, 15," Professor Edward Capps, University of Chicago.  
To be published in *Classical Philology*, Vol. I, No. 4.
7. "Is the *Aeneid* a Complete Poem?" Principal Maude A. Isherwood, Grand Haven High School.  
Published in *Proceedings of the Michigan Schoolmasters' Club*, 1906, pp. 67-70.

## THURSDAY AFTERNOON

Presiding Officer: Professor M. L. D'Ooge, University of Michigan.

SYMPOSIUM on "The Value of Literary, and Particularly Classical, Studies as a Preparation for the Study of the Professions."

8. "The Study of Greek and Latin as a Preparation for the Study of Medicine," Dr. Victor C. Vaughan, Dean of the Department of Medicine and Surgery, University of Michigan.
9. Discussion of Dr. Vaughan's paper: Dr. Charles B. de Nancrede, Professor of Surgery, University of Michigan.
10. "The Place of Humanistic Studies in the Preparation of a Student of Medicine," Dr. Wilbert B. Hinsdale, Dean of the Homeopathic Medical College, University of Michigan.
11. "The Value of Humanistic Studies as a Preparation for the Study of Engineering," Herbert C. Sadler, Professor of Naval Architecture, University of Michigan.
12. Discussion of Professor Sadler's paper: Gardner S. Williams, Professor of Civil and Hydraulic Engineering, University of Michigan; George W. Patterson, Junior Professor of Electrical Engineering, University of Michigan; J. B. Davis, Associate Dean of the Department of Engineering, University of Michigan.
13. Discussion of the conditions revealed by Principal Swain's paper (No. 1): Principal F. L. Bliss, University School, Detroit; Superintendent W. G. Coburn, Battle Creek; Principal J. R. Bishop, Eastern High School, Detroit.

The Symposium was printed in full in the *School Review* for June, 1906. Through the kind assistance of the Board of Regents of the University of Michigan and the courtesy of the publishers of the *School Review*, it has been possible to secure a number of reprints for distribution among teachers and students. Those desiring a copy may address (inclosing a two-cent stamp for postage): MR. LOUIS P. JOCELYN, South Division Street, Ann Arbor, Michigan.

A similar symposium on "The Value of Humanistic Studies as a Preparation for the Study of Law and of Theology," will form a part of the programme of the next conference, in March, 1907.

## THURSDAY EVENING

Presiding Officer: Professor Max Winkler, University of Michigan.

14. "The Survival of the Classical Epic Tradition in Mediaeval Literature," Dr. George L. Hamilton, University of Michigan.

15. "The Influence of the Roman Law upon the Legal Systems of Modern Europe and America," Professor Joseph H. Drake, University of Michigan.  
The papers of Dr. Hamilton and Professor Drake form parts of extended studies the results of which will be published later.

## FRIDAY AFTERNOON, MARCH 30

Presiding Officer: Professor Edward Capps, University of Chicago.

16. "The Autobiographical Element in Latin Literature and Inscriptions," Professor Henry H. Armstrong, Juniata College, Pennsylvania.  
This paper will be published in *Records of the Past*.

17. "The Birth of Venus: A Greek Relief and a Renaissance Painting," (illustrated), Dr. Samuel A. Jeffers, California State Normal School, Pennsylvania.

Published in *Records of the Past*, Vol. V (July, 1906), pp. 204-13.

18. "The Tenth Satire of Juvenal and Dr. Johnson's *Vanity of Human Wishes*," Mr. Frank F. Potter, Geneva High School, New York.

Published in *Proceedings of the Michigan Schoolmasters' Club*, 1906, pp. 70-81.

19. "Present Schools and Theories of Latin Grammar," Professor John C. Rolfe, University of Pennsylvania.

Published in the *School Review* for October, 1906.

20. "Maron: A Mythological Study," Dr. Charles B. Newcomer, University of Michigan.

This paper will be published in *Classical Philology*, Vol. II, No. 1.

21. "The Roman Forum in the Summer of 1905" (illustrated), Professor Walter Dennison, University of Michigan.

Professor Dennison threw on the screen large views of the Forum in the summer of 1905, giving a brief account of his visit and a summary of the results of excavations in the preceding year.

## A CLASS OF CONTENT-PROBLEMS FOR HIGH-SCHOOL ALGEBRA

G. W. MYERS  
University of Chicago

Some fifteen years ago the doctrine of correlation was just beginning in the elementary school. Practical teachers in the grades then looked upon the advocates of the doctrine as faddists, or *visionaires*. First attempts to practice the doctrine were half-hearted, sporadic, and poorly planned. But the great influx of new material was threatening to submerge and to disrupt elementary-school curricula. School administrators felt that something must be done to avert disaster, and the most advanced of them began urging upon teachers the imperative need of studying into the larger unities of the rich supply of materials that had accumulated. Slowly the teachers took up the work. The first efforts to correlate the raw materials of education around a central idea were feeble, and but little better than travesties on the idea. School work became spotted. One idea was well—even brilliantly—worked out with the class; then there was rambling, time-filling, and wool-gathering. The new attempts became the target of sharp criticism, then of keen ridicule. But, by those who tested the doctrine, the brilliant spots were felt to be better than a dead level of stale insipidity. The patient maturing of the practical phases of the doctrine, and a fuller trying-out under the light of past failures, have at length secured the general, though sometimes tacit, adoption of the doctrine of correlation in all the leading elementary schools of our country. Nowadays every new subject that knocks for admission into the elementary school, no less than every one of the old pre-emptors of the ground, must justify its claims on grounds of its bearings on the all-round work of the school. All of these matters may serve well for enlightenment and encouragement in the struggle with intrenched tradition and buttressed conservatism in the secondary school.

As the field of battle for better teaching shifts from the elementary

to the secondary domain, it is only natural that the leaders of the reform should resort to the same line of tactics that has proved successful in the field already taken. Accordingly, the doctrines of correlation are recommended to secondary teachers who are seeking improvement. The danger which is always present at this point is that the recommendation will be construed to mean the same phase of correlation as has wrought the improvement in elementary teaching. But it will hardly be expected that the same breadth of correlation where *extensive* study is the characteristic feature of the pupil's effort can be successfully attempted where *intensive* work is wanted from the student, as is the case in the secondary school.

The law that what is best for the adult is not necessarily best for the child, which has protected elementary programs from the *ex cathedra* utterances of college teachers, may well be stated now and then the other way around. This shifts the emphasis and materially alters the meaning. What is best for the child is not necessarily best for adults. As an illustration, it may be cited that, while an adult can very profitably work under a *remote motive*, a child needs an immediate motive to draw forth his best effort. But the change from the mental traits of childhood to those of adulthood is a growth. No one can put his finger on any stage of the school career and say *here* is an abrupt break in continuity of growth. By the beginning of the high-school period, however, there has been a very considerable accumulation of modifications, and the significant question for the practical high-school man is: What do these changes mean as to the necessary modifications of, or deviations from, elementary-school procedure? Programs of study, textbooks, and discussions all seem to pre-suppose only *difference* of procedure. However unphilosophical this consensus may be, it can nevertheless be explained, if not justified, historically. The vital question is: How much of likeness and how much of difference should characterize elementary and secondary work? It is this unanswered question which makes the chief trouble for mathematics.

It has been customary of late to argue and to work for an all-embracing correlation of early high-school mathematics with science and with the quantitative phase of the pupil's life. This sort of correlation, though ideal, is very seriously hampered both by the

present order of science subjects in the curriculum and by the extreme difficulty of so organizing the pupil's out-of-school interests as to accomplish the ends of mathematical study. The difficulty just mentioned is, nevertheless, being attacked, and progress is being made in overcoming it; but progress in this direction is necessarily slow.

Some have narrowed the problem of correlation down to a unification of *mathematics* and *physics* in teaching. But even this phase of the problem of securing a continuity and homogeneity to the pupil's school life, commendable as it is, is hampered both by the present arrangement of subjects in the program and by the difficulty of procuring teachers that are able to handle well both physics and mathematics. In the May number of this journal Mr. Moore narrows the problem of correlation still more closely. As a first stage in progress toward a full-orbed correlation of all cognate quantitative concerns of the pupil, his suggestion is to correlate, or to unify, the *mathematical subjects* into a homogeneous body of truth through the extensive and continuous use of the cross-ruled paper. This plan is eminently practicable. Programs need not be disturbed outside the mathematical subjects, and these disturbances may readily be taken care of by mathematical teachers themselves. There can be no objection to the proposal on grounds of expense, for cross-lined paper can be had at a cost so nominal that pupils themselves can bear the burden. From the numerous and varied uses of the graph that Mr. Moore suggests, it would seem that everyone who desires to assist in improving teaching—and who does not?—could readily find a place to lay hold at once. The paper points out in detail how any analytical operation a high-school pupil is ordinarily called upon to make, as well as many other operations that are too complicated for him analytically, may be simply and vividly put before him graphically by the aid of the cross-ruled paper. If this graphical work be now put into some sort of organic relationship with real problem-work—work that seems real to the pupil—that best of all results of teaching will in good degree be secured, viz., an interest in and love for mathematical thinking. As teachers of mathematics we need to keep continually before our minds the fact that the highest of all educational aims

is neither *learning* nor the mere *power to acquire learning*, but a *real love to learn*. Interest and purpose are necessary to the attainment of this aim in mathematical study.

It is the demand of the hour for high-school mathematics, and is the spirit of Mr. Moore's paper, that some means must be found of enabling the pupil, as early and as continuously as possible, to realize the worth to him of his mathematical tasks. The problem of arousing and sustaining interest will then be solved. The work must have such content and treatment as to place and keep the pupil where, by his own standards of worth, he may both gauge and approve the merit of what he is required to do. It is not the intention even remotely to imply by the foregoing statement that the teacher is to ask the pupil whether the latter thinks a proposed task is worth while. What is intended is that the nature of the tasks put before the learner shall be such that, no matter how great their difficulty, there will be a steady undertone of assent on the part of the learner that the tasks are worth the effort. This is recognized as essential in other subjects. It must be so recognized in mathematics before its full educational value can be realized.

Youth of the early high-school period are profoundly impressed with "the *go*" and "the *do*" of things. They feel that they have added a cubit to their mental stature when they have learned a new truth about the way man and nature accomplish results. The number of young persons on the bleachers at a high-school game, who are enthusiasts in convincing listeners that they know how to do it is out of all proportion to the number who can actually do it. Some have criticized our school system as a producer of "lip-doers" rather than actual doers. Be this as it may, the normal youth of fourteen to sixteen, or seventeen, loves to learn how the forces of nature are made to do the work of man and of nature. A machine is of interest to him, not as a machine, but because it does something. A large number of our simple machines, utensils, and our commonest apparatus are based upon the laws of parallel forces, and, with very little time and almost no technical introduction, numerous problems, covering a wide range of algebraic theory and technique, might be used to enrich the content of early algebra with conceptional material that makes a general appeal to youth. It is the main purpose of



this paper to show how easy and practicable it is for mathematical teachers to levy tribute from this field.

Two simple principles, or laws, will be needed, and it will be shown here how, in three forty-five minute recitation periods first-year pupils were given a working hold on these laws.

A light, wooden bar, as *ss* in the accompanying figure, was so arranged that it might move easily upward or downward, but could not turn around, when upward and downward forces were applied to it at the pegs, along the bar.<sup>1</sup> Two pegs, one at the middle of

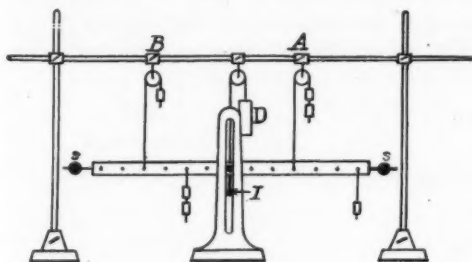


FIG. 1

the bar and the other a little below it at *I*, work easily within a slot and prevent the bar from turning. The balls at *s* and *s* could be screwed inward or outward to balance the *unloaded* bar horizontally.

Weight enough was then placed at *D* to hold the empty bar suspended. After the balances were adjusted, the class was told to pay no further attention to the weights at *D* and at *ss*. These were merely a part of a device for getting a *weightless bar* (or it may be called a *beam*) that may move easily upward, or downward, without turning.<sup>2</sup>

Light weights could then be hooked on any of the pegs, and, by pulleys, such as those at *A* and *B* in the figure, forces pulling

<sup>1</sup> In this connection compare an article entitled "Algebra Evolved from the Learner's Experience," by Arthur C. Lunn, in *Mathematical Supplement of School Science*, April, 1903; also, "An Algebraic Balance," by E. C. Donecker, in *School Science and Mathematics*, June, 1905; also, "Another Algebraic Balance," by N. J. Lennes, *ibid.*, November, 1905.

<sup>2</sup> The bar and weights used in the apparatus of this paper are parts of an apparatus for experimenting with forces, designated "Mechanical Powers, No. 382," p. 37, of the *Catalogue* of C. H. Stoelting & Co., 31-45 West Randolph street, Chicago, for 1901. With these pieces the work of fitting up the apparatus is almost nothing at all. With only a little more trouble one may provide himself with a home-made device that is good enough. Spools will answer for pulleys.

upward could also be applied at any of the pegs. Any number of pulleys could be quickly hooked over the rod  $AB$ . The pegs were equally spaced, and the individual weights were all equal. (Small cans, loaded equally with sand, will answer.) The weight of each was called  $w$  or  $x$ . Weights pulling upward were written and called positive; those pulling downward, negative.

The class was asked, for each loading, to begin on the left, and to record the circumstances of each loading in the form of an algebraic expression, and to show the value of each expression by an equation. In this expression each force entered as a monomial term with its appropriate sign. For example, with the loading shown in the foregoing cut, the class wrote in their notebooks the following record:

Equation	Result
$+x-2x+2x-x=0$ . . . . .	No movement

For other loadings, the records were as follows:

Equation	Result
$+3x-x-x-x=0$ , . . . . .	No movement
$+2x-3x+2x-2x=-x$ . . . . .	Movement downward
$-4x+2x-2x+5x=+x$ . . . . .	Movement upward
etc.	etc.

A half-dozen to a dozen such records were made, and the "Result" was obtained by noticing the behavior of the bar.

Pupils were next asked to examine their records to see whether, for imaginary loadings, they could tell from the equation what the bar would do. The class was then given such expressions as  $+5x-3x+2x-x$ ;  $+4x-x+3x-4x-2x$ ; etc. Many made correct predictions and records, and the rest soon "caught the scheme." When there was trouble, the apparatus was resorted to.

Pupils were then asked to state what the value of the algebraic sums of all the forces acting on the bar must be *for balance*. With little difficulty, the substance of the following statement was brought out and accepted as the first law for parallel forces:

**LAW I:** *For balance, the algebraic sum of all the forces acting on a bar, or beam, is equal to zero.*

Beginning at the first peg to the right of the center, the pegs on the right were designated  $r_1, r_2, r_3, r_4, r_5$ , and  $r_6$ ; and those on the



or downward as a whole, i. e., *in translation*. The bar was balanced empty by the aid of the ball *B*. A weight,  $x$ , being at  $r_1$  was seen to turn the right end of the bar downward; while a weight  $x$ , pulling upward at  $r_1$  by aid of the pulley, turned the right end upward. Here were two kinds of turning motion, which needed to be distinguished. The kind of turning which the positive force produced, i. e. *anti-clockwise*, was called *positive*, and the opposite kind, i. e., the *clockwise*, was called *negative*. The problem was now to measure and express these *turning tendencies*, or *leverages*, as numbers. The pulley was placed above the peg  $r_1$ , and loaded with one weight,  $w$ , and weight enough was hung to the peg  $r_1$  to prevent turning. Then the pulley was slipped to the right so that an upward force of  $w$  acted on the peg  $r_2$ , and enough weights ( $2w$ ) were hung to peg  $r_1$  to prevent turning. The pulley was then slipped along so that an upward force of  $w$  could be applied successively to  $r_3$ , to  $r_4$ , to  $r_5$ , etc., and in each case weights enough were hung to  $r_1$  to prevent turning. Calling the distances between the pegs 1 (unity), it was soon found that the number of weights on  $r_1$  was always equal to the product of the number of weights on the pulley-cord by the number of units in the distance from *C* to the peg where the upward force was applied to the bar. Since the bar balanced only when the *positive turning tendency* of the upward force was just equal to the *negative turning tendency* of the downward force, it was clear that the number of weights on peg  $r_1$  *measured the turning tendency* of the upward (positive) force. The distance from *C* to the peg, where any one of the forces, upward or downward, was attached to the bar, was now named the *arm of the force*, and the *turning tendency, or leverage*, of any force was defined to be the *product of number of units in the force by the length of its arm*. The class was now told to call the distance between any two adjacent pegs  $x$ , and to express all arms in terms of  $x$ . Records were then made as was done in deriving Law I. For the loading shown in the cut the record was:

Equation	Result
$(-3w)(x) + (+w)(3x) = 0$	No turning

\*The + 's between the several products were read "and." Thus "minus  $3w$  times  $x$  and plus  $w$  times  $3x = -3wx + 3wx = 0$ ."

Looking at the bar, the class saw that the first force had a *negative*, and the second a *positive*, turning tendency. Hence,  $(-3w)(x) + (+w)(3x) = -3wx + 3wx = 0$ .

Other records with two, or more, forces were as follows:

Equation	Result
(1) $(+3w)(2x) + (-2w)(3x) =$ $+6wx - 6wx = 0$ . . . . .	No turning
(2) $(-4w)(2x) + (+w)(2x) + (+2w)(3x) =$ $-8wx + 2wx + 6wx = 0$ . . . . .	No turning
(3) $(-3w)(2x) + (+w)(2x) + (+2w)(3x) =$ $-6wx + 2wx + 6wx = +2wx$ . . . . .	Positive turning
(4) $(-5w)(2x) + (+w)(2x) + (2w)(3x) =$ $-10wx + 2wx + 6wx = -2wx$ . . . . .	Negative turning
etc.	etc.

Enough loadings were given to make the pupils sure of their interpretations of signs and turning tendencies. By examining a dozen such records as the above, the fact was soon brought out that for balance of this bar, the algebraic sum of the turning tendencies of all the forces must be equal to zero. This form of the apparatus was then changed for that shown in the following cut.

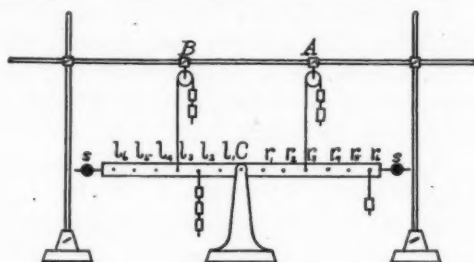


FIG. 3

For this new form of apparatus the following agreements were made and recorded on the blackboard and in the notebooks:

1. Forces pulling upward on the bar shall be called *positive*, and written  $+$ ; those pulling downward, *negative*, and written  $-$ .
2. Arms measured from *C* toward the right shall be called *positive*; toward the left, *negative*.
3. Turning tendencies anti-clockwise shall be called *positive*; clockwise, *negative*.

It is well worth while to give more extended use of the laws of signs in sums and products of signed numbers, than is customary.

A number of loadings were then given and the circumstances recorded thus:

Equation	Result
(1) $(+2w)(-3x) + (-3w)(-2x) + (+2w)(+3x) + (-w)(+6x) = -6wx + 6wx + 6wx - 6wx = 0$	No turning
(2) $(+2w)(-3x) + (-3w)(-2x) + (+w)(+3x) + (-w)(+6x) = -6wx + 6wx + 3wx - 6wx = -3wx$	Negative turning
(3) $(+w)(-5x) + (-2w)(-3x) + (+3w)(+2x) + (-w)(+6x) = -5wx + 6wx + 6wx - 6wx = +wx$	Positive turning
(4) $(+2w)(-6x) + (-w)(-2x) + (-w)(-x) + (+4w)(+3x) = -12wx + 2wx + wx + 12wx = +3wx$	Positive turning
(5) $(+2w)(-5x) + (+w)(-2x) + (+4w)(+x) + (+4w)(+2x) = -10wx - 2wx + 4wx + 8wx = 0$	No turning
etc.	etc.

A number of imaginary loadings were now given, and the class was asked to make records from the equations without reference to the bar. It was soon apparent that everything could be obtained directly from the equation and that the apparatus was no longer necessary. The *second law* of parallel forces was easily derived from an examination of the records, and was stated and written in the notebooks and on the board:

*Law II. For balance, the algebraic sum of all turning tendencies must equal zero.*

From here on the class was required to take on faith the generalization that, if any sort of bar, beam, or body whatsoever is in equilibrium—i. e., is lying still—under the action of parallel forces, the two laws just derived always hold good.

It was thought well to convince the class that the arms need not be measured always from the middle of the bar, or body; but that they may be measured from *any convenient point along the bar*, and, in particular, from either end. The only requirement was shown to be that, once a point (called the *turning-point*) has been selected to measure arms from, all arms throughout any problem must be measured from this same point. Some of the loadings and exer-

cises given above were solved by taking the turning-point, real or assumed, at some side peg, or at an end peg. The results always agreed with the previous solutions, though the forms of the equations differed with the choice of the turning-point. This is an advantage for teaching, as by a suitable choice of the turning-point the teacher may obtain the form of equation he desires.

By the aid of the two laws of force and of the four axioms of addition, of subtraction, of multiplication, and of division, a variety of practical problems, such as the following, were solved. It seemed well to enhance the pupil's confidence in the utility of the laws by giving first some problems so simple that the pupil could know the result from the outset, and to rise gradually to more difficult problems, whose results could not be foreseen.

#### SAMPLES OF PROBLEMS AND TYPES OF EQUATIONS THEY CALL FOR

1. A basket, weighing 84 lb., hangs on a stick 6 ft. long at a point  $1\frac{1}{2}$  ft. from the end, while it is being carried by two boys, one at each end of the stick. How much does each boy lift?

Taking the turning-point at the middle of the stick, and denoting the weight borne by the boy carrying the short end by  $x$ , and that borne by the other boy by  $y$ , we write from Law I,  $x+y-84=0$ , giving  $x+y=84$ ; and from Law II,  $(+x)(-3)+(-84)(-1\frac{1}{2})+(+y)(+3)=0$ , giving  $-3x+3y=-126$ .

The solution of the reduced forms calls for standard algebraic methods.

2. Solve a problem like 1, supposing the basket to weigh 60 lb., and to hang at a point 1 ft. from the end of a 4 ft. stick; 2 ft. from the end; 3 ft. from the end.

Taking the turning-point at the middle and denoting the forces as before, the reduced forms of the required equations are:

$$(1) \begin{cases} x+y=60 \\ 2x-2y=60 \end{cases} \quad (2) \begin{cases} x+y=60 \\ 2x-2y=0 \end{cases} \quad (3) \begin{cases} x+y=60 \\ 2x-2y=-60 \end{cases}$$

All these are familiar enough as types of linear, simultaneous equations.

3. Two men lifting, one at each end of a stick 8 ft. long, raise a certain weight. How heavy is the weight, and at what point does it hang, if one man lifts 25 lb. and the other 75 lb.?



Solution: From Law I,  $+25-w+75=0$ , whence  $w=100$  lb. Taking the turning-point at the middle of the stick: From Law II  $(+25)(-4)+(-w)(-x)+(75)(+4)=0$  ( $-x$  being the arm of the weight); whence  $wx=-300+100=-200$ . Since  $w=100$ ,  $x=-2$ . Interpret the result by a sketch.

4. Suppose a bar 10 ft. long, weighing 30 lb., to be used by two men, one grasping it at each end, to carry a load of 170 lb. How many pounds must each man carry, if the load hangs from a point 2 ft. from the front end?

NOTE—The weight, 30 lb., of the bar itself may be treated as a load of 30 lb. hanging to the bar at its middle point.

Solution: Taking the turning-point at the middle of the bar, we have from Law I:  $+x-170-30+y=0$ , whence  $x+y=200$ ; Law II:  $-5x+510-0+5y=0$ , whence  $-5x+5y=-510$ , or  $-x+y=-102$ .

REMARK.—The zero-term in the second equation arises from the leverage of the weight of the bar, which is  $30 \times 0$ . Here is a chance for a concrete interpretation and an algebraic treatment of the product of *any number multiplied by zero*.

5. A stone slab, weighing 2400 lb., rests with its edge on a crow-bar 6 ft. long, at a point 6 in. from the end which is used as the fulcrum. How many pounds of force must a man lifting at the other end of the bar exert just to raise the stone, (1) omitting the weight of the bar itself? (2) if the bar itself weighs 40 lb.?

Solution of (1): From Law I:  $+F-2400+x=0$ ; or,  $F+x=2400$ . From Law II:  $-3F+6000+3x=0$ ; or,  $-3F+3x=-6000$  (turning-point at middle of bar).

Since the pressure of the support at the fulcrum is usually not wanted, we might take the turning-point *at the fulcrum-end*, whereupon Law II would give:  $(+F)(0)+(-2400)(+\frac{1}{2})+(+x)(+6)=0$ ; or,  $6x-1200=0$ , whence  $x=200$  lb.

REMARK.—This gives another actual practical use of the product of a finite number multiplied by zero. It is also clear that a teacher may adapt the problem to exemplify either the one or the two-unknown mode of solution.

6. Three boys desire to carry a 12-ft. log, weighing 240 lb. Two of the boys lift at the ends of a hand-spike placed cross-wise underneath the log, and the third boy carries the rear end of the log. Where must the hand-spike be placed that all may lift equally?

Solution: Taking the front end of the log as a turning-point, and calling  $x$  the distance from the turning-point to the spike, we have from Law I:  $2j - 240 + j = 0$ ; and from Law II:  $(+2j)(+x) + (-240)(+6) + (+j)(+12) = 0$ . From these equations we have:  $3j = 240$ , or  $j = 80$ , and  $2fx + 12j = 1440$ . Substituting  $j$ , we find  $x = 3$  ft. Interpret the result.

NOTE.—This is an easy case of algebraic problem in three unknowns. The form of the problem may be modified almost at the pleasure of the teacher, by taking the turning-point at other places along the log.

It is interesting gradually to generalize the foregoing problem by supposing, first, that the length of the log is 6 ft., and the weight 240 lb.; then, that the length is 6 ft., and the weight  $x$  lb., the number of boys still being three; and, finally, that the length is 6 ft., the weight is  $w$  lb., and the number of boys lifting at the spike is  $2n$  ( $n$  at either end of the spike, making in all,  $2n + 1$  boys).

We shall omit the solutions of the following, but they will be found to involve interesting and varied algebraic forms.

7. A steel beam 24 ft. long, and weighing 120 lb. per yard, is being moved by an axle, borne by a pair of wheels placed under it at a point  $x$  ft. back of the front end and  $y$  ft. in front of the middle point. The rear end is being carried. If the weight carried at the rear end is 200 lb., what must be the values of  $x$  and  $y$  and of the weight,  $w$ , on the axle just to move the beam?

8. How may a railroad rail weighing more than a ton be weighed with a spring balance running only up to 50 pounds?

9. A wheelbarrow is loaded with 45 bricks weighing 6 lb. each. What lifting-force will be needed at the handles just to raise the load, if the hand is  $4\frac{1}{2}$  ft. and the center line of the load is 2 ft. back of the center of the wheel?

10. The box of a push-cart is 5 ft. long, and, when full, it holds 660 lb. of earth. The axle is  $1\frac{1}{2}$  ft., and the handle-bar is 7 ft., back of the front end of the box. When loaded with earth, what lifting-force at the handle-bar will just raise the legs from the ground, and what will then be the weight on the axle?

11. If the legs of the push-cart of problem 10 are just under the rear end of the box, what will be the weight on them, and what the weight on the axle, if the cart is standing still on level ground, and loaded with earth?

12. The handle of a suction-pump works against a pin 2 in. from the point where the plunger is attached to it, and the hand seizes the handle

3 ft. from the same point. What lifting-force will be exerted on the plunger, and what will be the pressure on the pin by a downward thrust of 20 lb. at the hand; this being just force enough to work the pump?

13. The arms of a balance are  $x$  and  $y$ . When a mass  $w$  is placed in one scale-pan, 16 lb. placed in the other pan will just balance it. When the mass,  $w$ , is placed in the other pan, only 9 lb. are needed to balance it. What is the correct weight of  $w$ ? What are the lengths of the arms?

Solution: Law II gives  $(-w)(-x) + (+F)(0) + (-16)(+6) = 0$ , or  $wx = 16y$ , for the first weighing; Law II gives  $(-9)(-x) + (+F)(0) + (+w)(+y) = 0$ , or  $9x = wy$ , for the second weighing.

Dividing, we readily find  $w = \pm \sqrt{144} = \pm 12$ . Interpret the double sign. Here algebra shows itself liberal and provides for the possibility that the weights may pull either *upward* or *downward*.

Taking other values instead of the 9 and 16, as 10 and 12, we have a practical problem for the introduction to the study of radicals, for we should then have  $w = \pm \sqrt{120}$ .

Multiplying the equations, we readily find  $\frac{x^2}{y^2} = \frac{16}{9}$ , whence  $\frac{x}{y} = \pm \frac{4}{3}$ . Interpret. Can the plus sign have meaning here? If

10 lb. and 12 lb. were used, we should have  $\frac{x}{y} = \sqrt{\frac{10}{12}}$ , and again there is a call for radicals.

Common road wagons, carriages, automobiles, floor-joists, bridge-girders, roof-trusses, etc., furnish an abundance of conditions calling for simultaneous equations. The reply that such problems call for much technical knowledge is untenable. Only the two laws already given are needed. Space permits only a few more examples to illustrate how this work may be given a formal turn.

14. A floor-joint lies at rest under the three parallel forces  $+x$ ,  $+y$ , and  $-5$ , whose arms are,  $+3$ ,  $-2$ , and  $+1$ , respectively. Find the strength of the unknown forces  $x$  and  $y$ .

15. A bridge-girder is at rest under the action of the forces  $+x$ ,  $-10$ ,  $+y$ , and  $-2$ , with arms, respectively,  $-4$ ,  $+2$ ,  $+5$ , and  $+11$ . Find  $x$  and  $y$ .

When quadratics are wanted, such problems as this will answer:

16. A roof-truss lies at rest under the forces  $+x$ ,  $+y$ , and  $-2$ , with arms  $+x$ ,  $-y$ , and  $+8$ . Find the values of  $x$  and  $y$ .

The equations here needed are  $x+y=2$ , and  $x^2-y^2=16$ . Such equations will not be denied an algebraic value, even by the ultra-formalist.

From now on formal problems of any of the customary algebraic types of linear, or linear and quadratic, simultaneous equations may be taken up with understanding on the pupil's part. The work will be backed up with a feeling on the part of the learner that such problems are called for by matters that have a modern meaning and a real use, at least; and this much cannot be said to the credit of the work which the high-school pupil of algebra is commonly called upon to do. High-school pupils work much better under a *mixed* than under a *pure* faith in the ultimate usefulness of what they are required to do.

Almost everyone of the foregoing equations might profitably be given a graphical treatment. It was the purpose of this paper to show at least one rich and easily accessible field to draw upon for material to vitalize and to conceptualize the equations and functions that Mr. Moore would treat very extensively by the aid of cross-ruled paper. It is believed that enough has already been given to accomplish this purpose. If there are those who still doubt the value of such work as is here advocated, let them allow their doubts and skepticism to be dissipated by the test of practical trial!

## AN EXPERIENCE WITH THE ÆNEID

ELIZABETH HAZELTON HAIGHT  
Vassar College

Is the *Aeneid* taught well by the average teacher in the secondary school? That question recurred to me when I read<sup>1</sup> an account of Cicero's popularity in Maine, and of the lack of appreciation shown by Maine boys and girls for Vergil. The writer of the article gives very frankly their point of view, and it is perhaps representative of a common, youthful indifference to the epic.

The virtues of the pious Aeneas were of a variety not mentioned in our Sunday-school lessons; we held his seamanship very cheap. "How did they ever git to Troy?" our class orator inquired dubiously. "There wa'n't one in the whole lot't knew any more 'bout navigation 'n a fly in a pan o' milk."

From the first we had no use for Dido. Love was an emotion which had been mentioned in our hearing, and there were boys and girls among our number who "went together" and displayed varying degrees of what we called "softness" in so doing. But that any human creature could be soft enough deliberately to toast herself upon a funeral pile, simply because another human creature sailed away and left her, was beyond our wildest conception of the tender passion. The uncouth lad who frequently wrote notes for general circulation among the girls of the class issued the following as soon as Dido's funeral intentions were announced:

"*Pass this on.* Dido was a Fool; how'd she know but Eneeus would be Blowed back by the first Wind?"

This callousness to the feeling of the poem and the drama of the story can be only partially explained by the author's implied reason that the class was plunged into Vergil too soon. That pedagogical mistake could hardly destroy all appreciation of the poem, had the teacher himself been as stirred by Vergil as by Cicero. At least that suspicion arises, strengthened by observation of the way in which the *Aeneid* is often taught—as an exercise in reading Latin without regard to its content, its literary connections as an epic, or its historical significance.

<sup>1</sup> *Atlantic Monthly*, February, 1904.

Can this traditional reading of the *Aeneid* in the schools be made more interesting, more vital? Professor Bennett in his book<sup>1</sup> on teaching Latin gives a few general suggestions which indicate the sort of work that should be done in connection with the first six books: intensive work on the subject-matter; comparative work between Vergil and Homer; historical work on the relation of the poem to the Augustan age. In my own teaching I have evolved more detailed plans in accordance with these general principles which may suggest to the inexperienced teacher what collateral work can be done in a secondary school. The course was given in this way for several years to girls who were studying the *Aeneid* in the fourth year of a high-school course (after Caesar and Cicero), four periods of forty minutes each week being given throughout the year to translation, the fifth to Latin composition. The same work would surely appeal to the boys, and far from adding to the difficulties of the course, the collateral work gives an interest in the poem that makes the translation more a pleasure than a burden. Indeed, all variation from the old way of simply translating the Latin is but to intensify interest in the Latin, the poem itself in its full meaning and various relations standing as the goal of endeavor.

So in the beginning of the course in Vergil as in any new author, the new vocabulary, the poetic constructions, and the meter must be mastered first, and until the first book has been read little else can be done. But the reading of the hexameter cannot be begun too early, if a feeling for the Latin itself is to be developed, or the music ever made sweet upon the tongue. After three or four lessons in translation, the instructor may begin to read the Latin to the class, teaching "the ocean-roll of rhythm," first by imitation, then by analysis, always insisting on the quantitative basis for the line as something very different from the tripping accents of Longfellow's *Evangeline*, best measured perhaps by the slow march of men, shoulder to shoulder in even time. He will not find necessary the memorizing of the rules for quantity which he himself once learned so laboriously, but stating a few general principles—of syllables long or short by position, of regular case endings and terminations—he

<sup>1</sup>*The Teaching of Latin and Greek*, by Professors Bennett and Bristol, of Cornell University (Longmans, Green & Co.).

will trust that the Latin, read with accurate quantities as it should be taught from the beginning, will make poetry, just as *Evangeline* is poetry, when read without being scanned. Five minutes a day at the beginning of each recitation devoted to reading the Latin aloud, frequent marking of lines on the board, the occasional reading of the whole review in Latin, the memorizing of short passages—all these means will be effective in teaching a class how to read the *Aeneid*.

At the end of the first book—at the end of each, in fact—my plan was to give a day to general work. A list of questions was given to the class on the content of the book just finished, or on references for reading; then the recitation hour was spent in a general discussion of this work. Specimen lists of questions may be suggestive.

## ON BOOK I

- I. What is an epic poem?
- II. What is the difference between the natural epic and the literary epic? Give examples of each class.
- III. What epics did Vergil imitate? Who have imitated Vergil?
- IV. What are the conventional points in the introduction to an epic poem? Illustrate from the *Iliad*, the *Odyssey*, the *Aeneid*, *Paradise Lost*, and *Jerusalem Delivered*.
- V. What are the characteristics of an epic simile? Give illustrations from Book I of the *Aeneid*.
- VI. What is the central theme of the *Aeneid*? Mention two passages in this book in which the theme is developed.
- VII. Outline the narrative of the book.

## ON BOOK II

- I. Give an account of the life of Vergil.
- II. Outline the history of the Augustan Age.
- III. In connection with lines 469-514, describe the plan of the normal Roman house.
- IV. Compare the feeling toward Helen shown by Aeneas in II, 567-87 with that of Priam and the old men, *Iliad*, III, 146-65. Read the picture of Helen in Tennyson's "Dream of Fair Women."

## ON BOOK III

- I. Read the description of Scylla and Charybdis in *Odyssey*, XII, 73-110 and 235-59. (Use translations by Butcher and Lang, Palmer, or Bryant.) How far does Vergil in III, 410-32 and 554-69, imitate Homer in these descriptions?
- II. Read Milton's *Paradise Lost*, II, 650-61. How far does Milton imitate Vergil's description of Scylla?



III. Read Dante's *Inferno*, Canto XIII, for the imitation of the episode of Polydorus, *Æneid*. III, 19-68. Which description, Dante's or Vergil's, is more romantic? See Pater, *Appreciations with an Essay on Style*, Postscript, pp. 262, 263.

## ON BOOK IV

- I. What characteristics of Dido appear in this book? Of Aeneas?
  - II. What charges does Dido bring against Aeneas?
  - III. Are Dido's accusations of Aeneas justified?
  - IV. What part do the gods play in this book? Are they necessary to the development of the plot?
  - V. What is the fundamental difference in the relation between Aeneas and Dido, and that of Antony and Cleopatra?
- Why does modern feeling blame Aeneas for leaving Dido and Antony for staying with Cleopatra?

This fourth book always seemed to me the most difficult to teach well, although it is the most modern and romantic part of the *Æneid*. But as college freshmen laugh at Catulus, so high-school seniors like those in Maine either have no conception of passion, or find what seems an abnormal relation, an outrage to their sense of the fitting. I have always found, however, that the story of Dido and Aeneas was really intensely interesting to young people in that period of adolescence when the relation between men and women begins, consciously or unconsciously, to occupy their thoughts, and it seemed to me desirable that the subject-matter of Book IV should be discussed freely in order that its effect on the minds of the students might be understood and met. In three different years my class in Vergil held a debate on the question: "Resolved, That Dido's accusation of Aeneas was justified." The girls formulated the charges from Dido's own speeches:

- I. Of treachery in trying to depart secretly (IV, 305, 306).
- II. Of lack of fidelity to their relation (307, 316, 324, 431).
- III. Of ingratitude (317-19, 373-75).
- IV. Of lack of chivalry in leaving her defenseless in the midst of her enemies (320, 321, 325, 326).

This debate always aroused the warmest discussion, although at first invariably there was no one in the class who would volunteer to support Aeneas. But when one-half of the class had been compelled to take the unfortunate hero's side, a careful study of his own words, and a deeper thought in regard to his duty to his race and

the standards of the times, did much to win sympathy for the reluctant founder of an empire.

## ON BOOK V

I. Read a translation of *Iliad*, XXIII (Lang, Leaf, and Myer, or Bryant). Make a list of the contests in *Iliad*, XXIII, and of those in *Aeneid*, V. Compare the two, and see what material Vergil took from Homer and what he added.

Notice the details of the descriptions in both accounts, and see how far Vergil imitated Homer.

II. Read the account of the death of Nisus and Euryalus, *Aeneid*, IX, 184-449. (Conington's translation into verse. [Longmans, Green & Co.], pp. 293-304. Mackail's, pp. 198-206.)

## ON BOOK VI

I. Read a translation of *Odyssey*, XI.

II. Compare the Homeric Hades with the Vergilian in regard to:

- a) The general character of the region.
- b) The character of the inhabitants. (The instructor might, in connection with this work, outline to the class the elaborate plan of Dante's *Inferno* to show the continued increase of definiteness and vividness in the picture of the lower world.)

III. Read in Conington's Vergil the introduction to Book VI (Vol. II, pp. 423-26).

IV. State clearly the ideas of *Aeneid*, VI, 724-51. (Explain to the class simply pantheism, Platonism, Pythagoreanism.)

When the sixth book is finished, the narrative of the rest of the *Aeneid* should be told the class, that the pupils may have at least the outlines of the whole epic in mind. In this narrative, Aeneas seems more of a hero even to the modern youth, for as war is the subject of these six books and the *Iliad* their model, while the *Odyssey* is the model of the first six, so Aeneas in the last six is no longer Odysseus, the wanderer, but Achilles, the warrior. His passivity and repression in Carthage disappear on the field when Pallas, his youthful ally, is slain and natural grief arms him against Turnus, the slayer. The story of these six books has charm as well as power in romantic episodes like the death of Nisus and Euryalus, and the transformation of the Trojan galleys into sea-nymphs; again, in the women whom Vergil depicts with such understanding—the shadowy Lavinia, whose hand is the cause of the Latin war; Camilla, the Roman Joan of Arc, defending her native town; and Juturna, half goddess, wholly sister, who as her brother's charioteer tries to avert

his doom. All this narrative can be made vivid by the reading of passages in translation, and if this is done before a review of the first six books, a new interest and a new understanding are given to them.

No means to that end, however, seem as effective as special topic work. Of course, the subjects must be such as will appeal to the high-school pupil and the method of treatment very simple, but the value of the work is that it concentrates attention on the subject-matter of the poem and gives to each one a personal interest. The topics in the list given have been found practical by actual test.

- I. The character of Dido.
- II. The character of Aeneas.
- III. Andromache and Creusa.
- IV. The Old Men of the *Æneid*: Priam and Anchises.
- V. The Conception of Jupiter in the *Æneid*.
- VI. Religious Ceremonies in the *Æneid*.
- VII. The Prayers in the *Æneid*.
- VIII. Omens and Oracles.
- IX. Visions and Dreams.
- X. The Idea of Fate.
- XI. The Central Theme of the *Æneid*.
- XII. Vergil's Picture of the Future World.
- XIII. Vergil's Similes.
- XIV. Historical Allusions.
- XV. The Elements of the Horrible.
- XVI. Pictures of the Sea.
- XVII. Night Scenes.
- XVIII. Vergil's Debt to Homer.
- XIX. Memorable Lines and Phrases.

When the best of these topics were read to the class, the girls showed more interest in each other's work than they ever felt in Sellar's or Nettleship's interpretations, even crude comments by some one of their own age vivifying the content of the poem.

Another means to the same end is the use of pictures. In the ideal Vergil classroom there will be a few significant photographs on the wall: "Turner's "Dido Building the Walls of Carthage," Domenichino's "Aeneas and his Father," Jalabert's "Vergil, Horace, and Varius in the Gardens of Maecenas," and casts of the young Augustus and the emperor in armor, along with maps of Greece, Italy, and Rome. Rich illustrative material suggests itself to any

collector, and for the busy the Soule Company has made a collection of photographs illustrating the first six books of the *Aeneid*. Cheaper pictures from the Perry and the Brown Companies, and the possible blue-prints, may be collected by the pupils themselves—a work that proves fascinating to those who have not lost a childish fondness for scrap-book and paste-pot. One girl asked to be allowed to illustrate Vergil for her special topic work, and the hundred or more pictures she collected with the Latin lines illustrated written under them gave the whole class pleasure.

As delightful as such a connection between the epic and art is the connection between the epic and modern literature. To many young people Vergil is the guide to the *Inferno*, as he was to Dante, the first interest in the Italian being aroused by his mention of the master from whom he took his beautiful style. I remember my own pleasure when I first came upon Tennyson's poem written for the Mantuans, and read that wonderful appreciation in verse of the Latin poems I had loved. Even now in the current magazines, a watchful eye is rewarded by an occasional poem, like that by S. Cole in the *Atlantic* of January, 1903, "In Via Merulana," which paints as vividly as Jalabert's picture the gardens of Maecenas, with the great patron, "the hero of the Sabine farm," and Vergil himself, "who wrote for Rome her noblest song." Every modern appreciation of this sort, every tracing of Vergil's influence on the moderns like that by W. P. Mustard in *Classical Echoes in Tennyson*, intensifies the interest of a class in its author as a force though dead yet living.

I have said little about the instructor's tools, but the working library which he has at hand is really the foundation on which he builds. It is so true that the books which we have in our rooms are the books we really know. Few young instructors have a great library to use, and for such a small school library or a shelf beside one's desk is an indispensable aid. For this I add a brief bibliography.

By such simple means as those suggested, the study of the *Aeneid* can be made, I believe, far more alive and fruitful than it usually is. The aim of the instructor in carrying out these plans, in making others of his own, should be to teach the *Aeneid* as a great epic, in

its historical relation to Homer on the one hand, to Dante on the other; to show its historical significance as the voice of a visionist proclaiming in the new régime of Augustus' reign Rome's great past and her great future; and to find through the poem the hidden personality of the writer: in the large structure of the epic as well as in its parts, his idealization of Rome; in significant line and phrase, his understanding of life and its problems; in his characters, his knowledge of men and his sympathy; in his style—diction, phrase, figure, and rhythm—the fine workmanship of the great artist.

## A SUGGESTIVE BIBLIOGRAPHY

- The Works of Vergil.* By J. Conington and H. Nettleship. London: George Bell & Sons, 1898. 3 vols.
- Vergil.* By T. L. Papillon and A. E. Haigh. Oxford: Clarendon Press, 1892. 2 vols.
- Roman Poets of the Augustan Age: Vergil.* By W. Y. Sellar. Oxford: Clarendon Press.
- Lectures and Essays: Suggestions Introductory to a Study of the Aeneid.* By H. Nettleship. Oxford: Clarendon Press, 1885.
- Ancient Classics for English Readers: Vergil.* By W. L. Collins. Philadelphia, 1875.
- Classical Essays: Vergil.* By F. W. H. Myers. London, 1883. (The most sympathetic study of Aeneas.)
- Master Vergil.* By J. S. Tunison. Cincinnati: Robert Clarke & Co., 1890.
- Vergil in the Middle Ages.* By D. Comparetti, translated by E. F. M. Benecke. London, 1895.
- Ancient Lives of Vergil; with an Essay on the Poems of Vergil in connection with his Life and Time.* By H. Nettleship. Oxford, 1879.
- Unpublished Legends of Vergil.* By C. G. Leland. New York, 1900.
- The Country of Horace and Vergil.* By G. Boissier, translated by D. H. Fisher. London: T. Fisher Unwin, 1896.
- Augustus Caesar.* By J. B. Firth. New York: G. P. Putnam's Sons, 1903.
- The Teaching of Latin and Greek in the Secondary School.* By C. E. Bennett and G. P. Bristol. New York: Longmans, Green & Co., 1901.
- Studien über die Compositions-kunst Vergils in der Aeneide.* Von H. Belling. Leipzig, 1899.
- Vergil's epische Technik.* Von Richard Heinze. Leipzig: B. G. Teubner. 1903. (An invaluable commentary.)
- Aeneis, Buch 6.* Erklärt von E. Norden. Leipzig, 1903.
- Vergil und die epische Kunst.* Von H. T. Plüss. Leipzig, 1884.
- Aus Vergils Frühzeit.* Von F. Skutsch. Leipzig, 1901.

*La religion romaine.* Par G. Boissier. Paris, 1892. 2 vols. (Invaluable for the discussion of Book VI, and the religion of the Augustan Age.)

*Die römische Aeneassage von Naevius bis Vergilius.* Von F. Cauer. Leipzig: B. G. Teubner, 1886.

*Wörterbuch zu den Gedichten des P. Vergilius Maro.* Von K. E. Georges. Hannover, 1885.

## MAGAZINE ARTICLES

"Vergil." *Fortnightly Review.* By F. W. H. Myers. Vol. XXXI (1879), p. 163. (Same essay as in *Classical Essays*.)

"Vergil." By Julia Wedgwood. *Contemporary Review*, Vol. XXX (1877), p. 199. (A discussion of the modern element in Vergil. A suggestive article.)

"Vergil and Tennyson." *Littell's Living Age*, Vol. CXXVII, p. 756. (Very general; no real comparative work.)

"Vergil and Tennyson: a Literary Parallel." *Quarterly Review*, Vol. CXCI (1901), p. 99. (An interesting parallel of the lives and works of the two poets along general lines.)

"Vergil and Tennyson." By W. P. Mustard. *American Journal of Philology*, Vol. XX, p. 186. (Excellent detailed comparison; now published in *Classical Echoes in Tennyson*.)

"Aeneid." By W. C. Lawton. *Chautauquan*, Vol. XXVII, p. 29. (General Introduction.)

"English Translators of Vergil." *Littell's Living Age*, Vol. LXX, p. 739.

"Sea Descriptions of Vergil." *Ibid.*, Vol. CXXIII, p. 434. (Very full and suggestive.)

"Portraits of Vergil." By H. N. Fowler. *School Review*, Vol. VI, p. 598.

"Why Vergil Did Not Write the Aeneid?" *Atlantic Monthly*.

Vol. LXXXI, p. 574. (Entertaining account of the work of Père Jean Hardouin, a seventeenth-century Jesuit.)

"Dido: A Character Study." *School Review*, Vol. XII, p. 408. (Sympathetic appreciation.)

"Suggestions for Studying the Aeneid." *Chautauquan*, Vol. XXXIV, p. 199. (Too brief to be valuable.)

"Outline for the Study of Vergil's Aeneid, Book I." By M. E. Kingsley. *Education*, Vol. XXIII, p. 148. (Detailed and helpful plan.)

## THE PUPIL AND THE REQUIREMENT

MARY C. ROBINSON  
Bangor High School

Last summer it was my privilege to meet socially a professor in one of the great colleges for women to which every year we send our quota of maidens, and I eagerly took advantage of the opportunity to say: "I have wished for several years to send a message to the faculty of ——— College. I charge you to deliver it for me. It is this: *Youth is immature*. This is a fact which college authorities, especially those of women's colleges, do not suspect. Apparently it has never been called to their attention, but it is borne in upon my mind so forcibly, year by year, that I would gladly share my knowledge with them if I could."

The distinguished lady, whose department was not English literature but physical training, strange to say, had observed for herself that characteristic of youth, but she gave me no lively encouragement that she should be able to bring her colleagues to an understanding of it; and, indeed, I fear it is a thing only to be realized by those whose experience, day by day, forces them to face the condition, practically.

My complaint is that college instructors and professors of English, particularly in the women's colleges, expect our pupils to do work which they are not and cannot be fitted to do on account of the immutable laws of nature. These instructors understand clearly the capacities and limitations of the average girl of eighteen or nineteen whom we send to them, but they utterly fail to realize that she has not been eighteen or nineteen the four or five years during which she has been under our care.

No doubt there is a difference between the maturity of thought of a young woman of eighteen and the same young woman at twenty-two; this they realize. But this difference is as nothing compared with that between a girl of thirteen or fourteen and the same girl at seventeen or eighteen; and of this fact the college examiners in Eng-



lish are apparently quite unaware. They speak in their advice to us as if these girls had been uniformly during their high-school course at the stage of maturity in which they close it.

It is not thus, O my superiors! The children which we receive from the grammar school are little girls. The girl of thirteen, fourteen, or fifteen in the entering class is a child. Her hair is in pigtails, and I suspect, in some cases, that her dolls are still ranged on the nursery floor, discarded but not yet relegated to the attic. She is sweet, docile, and trustful. She has little or no acquaintance with literature, and less with life. What a prig she would be if it were otherwise!

Of course, I am speaking of the average girl. The exceptional girl exists; we all know her, and while we do what we can for her, yet it is plainly our duty to set the pace for the average girl, to round out her education, supply what is lacking, cultivate the powers that exist, and make our course and our requirements conform to her needs and capacities, not to those of the stray prodigy, who can usually take care of herself, and who, if she is occasionally bored by work more simple than she could master, at least is but one to suffer. Boredom is no doubt disagreeable, but it is a far more healthful state than the condition of nervous strain, sometimes amounting to absolute terror, into which children are thrown who are required to do things that they cannot comprehend. It is downright cruelty to expect a class of thirty to rise to the level of one mind much more mature than the rest. They cannot do it; and there is so much that they can do with profit, and often that they desperately need to do!

"Moving about in worlds not realized" calls up a delightful vision poetically; but what if one is expected to analyze the unrealized worlds, to write papers describing them, and to pass an examination to show that one has felt the proper sensations in the course of the journey?

These girls of average ability, in their first year in the high school, can read with pleasure and profit *Ivanhoe*, *Julius Caesar*, *Idylls of the King*, or works of that kind. They enjoy the narrative of the *Idylls* and appreciate the beauty of the diction, when it is judiciously pointed out to them, and understand and are in sympathy with the

noble ideals of the poems. *Julius Caesar* is, in some respects, the best textbook in the world. I have yet to see a pupil, boy or girl, so dull or so immature that he cannot study this play with interest and profit. From *Ivanhoe* our pupils can learn something of the structure of the novel as a literary type, and assimilate a great deal of "background" for future literary and historical studies. In the course of fourteen years' experience in teaching English, how often have I groped around for some common ground of knowledge in my class, with which to compare or to correlate some literary reference, and met only blank, unresponsive looks, until I hit upon *Ivanhoe*; then there was instant response. Let us be thankful for *Ivanhoe* and all it contains of chivalry, history, and etymology, in the form that a child can understand.

What the child cannot do, however, is to compare *Ivanhoe* with other masterpieces: for she has not read them. Dickens is absolutely unknown to her; Thackeray as remote from her experience as Kant; Hawthorne and Cooper, mere names. Ask her to write an essay upon her favorite story, and—if she has been properly brought up—it will be *Little Women* or *Rebecca of Sunnybrook Farm*; if her reading has been less carefully watched, it may be one of Bertha M. Clay's or "The Duchess." In poetry she will be even farther at sea. One can count on the average girl's familiarity with a few poems of Longfellow, and that is all.

If you have the good luck to teach a class which comes from fairly intelligent homes, half its number will not make glaring errors in spelling and punctuation; but duty to the other half demands constant practice upon these subjects. The compositions which the pupils write will be childlike in their simplicity and naïveté, and, if you are so fortunate as to arouse their enthusiasm, the fresh joy of youth in their work, their charming discoveries of things centuries old, will bring tears of pride and pleasure to your eyes; but of the keen, discriminating, mature literary criticism, which is founded upon wide reading and comparison, there will not be a trace, and there ought not to be.

When our little girls come back to us at the beginning of their second year, they show a very great growth in maturity of thought. Many things that were completely beyond them the previous year

are now easily within their grasp. This development has come "by nature;" it is not in the power of any teacher or training to produce it before it is due. Indeed, when I see so much brought about that is absolutely independent of school discipline, I should become skeptical as to the value of training in English at all if now and then, once in a few years, a pupil did not appear who, by reason of illness or some other cause, has omitted the English work for a half-year, trusting to read it up by herself, or, if necessary, to "take a few lessons" upon it later on; the blanks in the equipment of such a one always restore my self-respect.

At the beginning of the third year the pupils have taken a still more noticeable stride in the direction of maturity. The days of dolls, which were definitely in sight during their first year, now seem to them very far in the past. Dresses are dropped to the tops of the boots, or even to the ankles. Mentally they are ready to understand and appreciate, with careful training, such a work as Macaulay's *Essay on Milton*, and to discuss intelligently his famous paradox regarding poetry and civilization. They can read the *Ancient Mariner* without regarding it as a comic poem; they can read *Comus*, though it is unsuited to them; and they can understand something of *Lycidas*, with considerable help. Burke and *Macbeth*, in my judgment, ought to be reserved for the fourth year, though I have known more than one class of pupils in their third year to get much good from the study of these works. What I maintain, however, is that the work in these lines or in any others must be done with a difference. As well expect original thought of a mature sort from girls of sixteen as expect the discovery of radium from a high-school student. Supposing we might for a moment imagine that he could hit upon it, he wouldn't know what it was or what to do with it; so with our pupils—they have only glimmering ideas of relative values. The flat, stale, and unprofitable is new to them and often arouses their keenest interest, while what is really new and in the line of modern investigation is at present beyond their appreciation.

To us who are older, no doubt, it savors of the trite to say that Macaulay used many antitheses, that Milton wrote sublime poetry, that Shakespeare was a great delineator of character; but these things are absolutely new to most of our pupils. They must learn to see and to

appreciate such facts for themselves before they are prepared to meddle with the subtleties of literary criticism. Sometimes I think that those in authority over us believe that our school-girls learn essentials by intuition, so much is taken for granted.

In a volume of the questions for the "Middle States and Maryland" examinations I find the following:

1. Analyze the plot of the *Merchant of Venice*, showing the different elements and the way in which they are combined into one play.

Does this seem to you a fair question to ask of a girl who has had to get ready also for examinations in Latin, Greek, mathematics, Greek and Roman history, and either a modern language or a science? Is it not rather a question suitable for a professor of English literature, who has made a thorough study of the play and has had leisure to meditate upon it with mature understanding?

2. Discuss Tennyson as a story-teller, pointing out how far you think the interest of *The Princess* lies in the narrative.

This is one of those searching questions implying the maturity of thought, judgment, and wide reading. How shall one discuss Tennyson as a story-teller if one has read no other narrative in verse? Or should we compare him with Miss Alcott or The Duchess?

3. Analyze either Macaulay's *Essay on Addison* or his *Essay on Milton* so as to show its construction, noting the development of the theme and its main transitions.

Now, I think that I could answer this question myself. Long, painful, and, alas, often unwilling practice in analyzing these two essays have made the lines of thought, together with the various ramifications and digressions in them, as familiar to me as the Mother-Goose of my childhood; but did anyone ever seriously believe that an ordinary school-girl ought to be expected to carry in her head the ground plan of these two essays? Human nature revolts at the thought.

To be sure, many of our girls enter "on certificate" and are not obliged to pass the examinations at all. Very true, but still the examinations set a certain standard to which those pupils who are certified are expected to conform. Verily, such questions as these are binding heavy burdens and grievous to be borne around the necks of these little ones.

A recent paper in the *School Review* by one of the faculty of a great woman's college says:

Every student should be so thoroughly trained in the art of investigating that he will know immediately where to look for the information which he needs in the endeavor to understand certain passages in his text. To know the best sources of information is to know how to study with scholarly precision and self-reliance. If, in a volume, a reference is made to a fact in history, a student should know, in order to look for an elucidation of this, the names of the best histories of America, of England, and of the world, and so be able to turn at once, without waste of time, to an accepted authority. If a reference to a geographical spot is found, he should be prepared to look up the place on the map and fix upon his mind the special surroundings. If a reference to classical mythology enters, he should turn to the classical dictionary and find out the facts that are essential to a clear understanding of the allusion. If a famous person is mentioned, he should know where to turn in order to inform himself of the life-history of that person as recorded in trustworthy biographical dictionaries. If a new word is discovered in his text, he should turn at once to the dictionary and discover for himself the four essential facts in regard to it: derivation, pronunciation, meaning, and synonyms.

In the days of the "Committee of Ten" a teacher of much wisdom and experience said to me that his only criticism upon their report was that it left the pupil entirely out of account. Now let us take the pupil into account in relation to the above admirable ideal. Let us say that she is a girl of sixteen, and at half-past two in the afternoon she has finished her dinner and is ready for her afternoon studying. She begins with her Greek, which takes an hour and a half of hard work. It is then four o'clock. Latin requires another hour and a half; it is then half-past five. She has time to begin her algebra before supper, but hardly more than that. She has a supper at six o'clock, in the average American home in this part of the country, and her mother is not willing that she should sit down to her books again until seven; so she takes a little walk. She finishes her algebra at eight, if she has good luck; and then comes a lesson on *Lycidas*, we will say. Do you really think that she is in a condition mentally to comply with the above requirement in the spirit in which it is intended to be taken? Don't you think, if you were in her place, you might neglect or shirk the least bit finding out all about

"Where the great Vision of the guarded mount  
Looks toward Namancos and Bayona's hold."

I have in mind a girl of sixteen who never would shirk the least

thing, but she boarded away from home and habitually went to bed at one o'clock, which, I claim, is a wicked thing, even at peril of her not knowing "all the facts which are essential to a clear understanding of the allusion." I know a boy of considerable conscientiousness who lost fifteen precious minutes last year trying to look up the word "austere" which had occurred in a dictated paragraph upon his English lesson. He could find it in no dictionary, but, happening to mention the circumstance to his mother, he learned that it wasn't to be sought under *os*, where he had been hopefully looking. If a student spends fifteen minutes looking up one word, how long will it take him to learn "with scholarly precision" all the references in Macaulay's *Essay on Milton*?

Do you observe that my average girl has had no time to read any of the twenty to forty pages of reference works in Roman history of which she must prepare an abstract within two days; for as yet Roman history is not required every day in the week? She has had no time for music, and a scant half-hour for exercise. If her mother insists on her going to bed at nine o'clock, as I hope she does, she has had barely time to prepare thoroughly the routine work in her regular studies. The study periods which she may have in school the next day offer some ground of hope, but ordinarily they will be required to put a final polish on lessons already prepared. How shall we expect of her the student's joy in investigating for its own sake? Above all, how shall we expect that definite, well-matured opinion upon the inner meaning of *Lycidas* which comes only after a thorough mastery of the simple meaning of the lines, after the poem has grown familiar and lain fallow in the brain for many long days or years?

O ye higher powers who set tasks for the little children under our care, pray don't forget that they are, and of a right ought to be, little children. Don't demand of us that we force these childish minds. What they give us naturally is charming in its truthfulness and awakening consciousness of beauty. Pray don't demand subtlety or set up an inhuman standard of excellence. There are many years before them in which to learn a number of things—or, if there are not, so much the more reason that their youth should be made pleasant to them. Let them be permitted to enjoy the study of the glories of their mother-tongue, instead of finding it a grievous burden.



## RECENT EDUCATIONAL BIBLIOGRAPHY

J. I. WYER

The New York State Library

In each October number of the *School Review* for the past nine years the present writer has listed and reviewed 190 items of current educational bibliography; lists of titles, catalogues, and collections of references on a wide range of subjects embraced under the term "education."

This work has, in an informal way, served to supplement the chapter entitled "Some Recent Educational Bibliographies" in the report of the United States Commissioner of Education for 1893-94, Vol. II, pp. 1701-22.

It is believed that all important items of educational bibliography have been included, from year to year, in these articles, and that the student of any educational topic may acquaint himself most readily with the existing literature of his subject by consulting these references.

The following mentionable items have been noted during the past year:

### ARBOR DAY

"Arbor Day List." By ELVA L. BASCOM. (In *American Library Association. Book List*, March, 1906, Vol. II, pp. 73-87.)

One of the best lists that have been printed of books and articles on Arbor Day, and of poetical and prose selections for school use. A list of the books from which selections have been made is added, with the customary abbreviated references which will facilitate use of the list in libraries. Every teacher who has access to any reasonable collection of poetry should find this list of great value in preparing for Arbor Day and in nature-work with trees.

### ARCHITECTURE (SEE SCHOOL ARCHITECTURE)

### ARITHMETIC

*Special Method in Arithmetic.* By C. A. McMURRY. New York, 1905.

Pp. 225, 12mo.

"Books for Teachers," pp. 223-25.

### CHILD-STUDY

'Bibliography of Child-Study for the Year 1904. By L. N. WILSON (In *Pedagogical Seminary*, September, 1905, Vol. XII, pp. 304-34.)

This is Dr. Wilson's eighth annual collation and record of the world's literature of child-study. It lists 429 titles, and is especially notable for references dealing with



collateral phases of the topic which, while often bearing remotely or indirectly on the subject, are yet of interest and value to the student of child-psychology.

## EDUCATION

*Text-book in the History of Education.* By PAUL MONROE. New York, 1905. Pp. 772, 8vo.

There are bibliographical references at the end of each chapter, but they contain few titles not readily found in our other and fuller bibliographies of this topic, and are chiefly useful to the reader of this particular volume.

*Pädagogischer Handkatalog: Ein Wegweiser durch die neuere Literatur auf dem Gebiete der Pädagogik und deren Hilfswissenschaften.* Unter Mitwirkung namhafter Schulmänner herausgegeben. Osterwieck, 1904. Pp. 94, 8vo.

"Books of the Year." (In *Schoolmaster's Year Book and Directory*, 1905, pp. 431-73.)

"Bibliography of Educational Books from November 1, 1904, to October 31, 1905. (*Ibid.*, 1906, pp. 388-419.)

The *Schoolmaster's Year Book* has within the past three years easily taken a place as the most useful British reference book on educational topics, being far and away in advance of any similar work in the United States. The bibliographic feature covers chiefly textbooks or editions of texts in English and foreign languages, for classroom use. The list does not aim to be complete; many helpful, brief notes are given; there are some American titles included, and occasional works of a more advanced character of interest to teachers. The lists are classified under convenient headings.

"Bibliography of Education for 1905." By J. I. WYER, JR., and MABEL E. LEONARD. (In *Educational Review*, September-October, 1906, Vol. XXXII.)

This is the seventh annual number of this analytic, selected, annotated list of the English literature of education. The first six numbers are in the *Educational Review* for April, 1900 and 1901, and for June, 1902, 1903, 1904, and 1905. The present number contains 665 titles, classified minutely by subjects and accompanied by a full author index. The compilers indicate the following titles as representing the cream of the year's literature, books that should be read by, or accurately known to, every serious student of education. The books are roughly grouped by subjects:

1. Bagley, *The Educative Process.*
2. Raymont, *Principles of Education.*
3. Lodge, *School Teaching and School Reform.*
4. Salisbury, *Theory of Teaching and Elementary Psychology.*
5. Monroe, *Text Book in the History of Education.*
6. Painter, *Great Pedagogical Essays*
7. Wilkins, *Roman Education.*
8. Bryant, *How to Tell Stories to Children.*
9. Payne, *Public Elementary School Curricula.*
10. Harper, *Trend in Higher Education.*
11. Moore, *The School House.*
12. Cubberley, *School Funds and Their Apportionment.*
13. Elliott, *Some Fiscal Aspects of Public Education.*
14. N. E. A., *Report on Salaries, Tenure, and Pensions.*

15. N. E. A., *Report on Taxation as Related to Public Education.*
16. Strayer, *City School Expenditures.*
17. Brumbaugh, *Making of a Teacher.*
18. Lawrance, *How to Conduct a Sunday School.*
19. Religious Education Association, *Proceedings*, Vol. III.
20. Wells, *Sunday School Problems.*
21. *From Servitude to Service.*
22. Washington, *Tuskegee and its People.*

## LANGUAGE

*Special Method in Language in the Eight Grades.* By C. A. McMURRY New York, 1905. Pp. 192, 12mo.  
 "Books for Teachers," pp. 192.

## LEARNED SOCIETIES

"Learned Societies and Academies in Early Times." By EDWARD CONRAD.  
 (In *Pedagogical Seminary*, December, 1905, Vol. XII, pp. 384-426.)  
 Pages 424-26 list forty-two titles of the chief works consulted in preparing this interesting paper.

## LIBRARIES (SEE SCHOOL LIBRARIES)

## MANUAL TRAINING

*Industrial Work for Public Schools.* By M. A. HOLTON and A. T. ROLLINS.  
 Rand, McNally, 1905. Pp. 134, 8vo. \$0.90.  
 "Industrial Work," as the authors here use the term, means weaving, whittling, raffia work, sewing, &c. Thirty-six unannotated titles of books only are appended.

## MEDICAL INSPECTION

"Considerations Respecting Medical Inspection in the Public Schools." (In *Bulletin of the American Academy of Medicine*, April, 1905, Vol. VI, pp. 923-32.  
 Pages 929 and 930 contain bibliographical references.

## MICHIGAN—EDUCATION

*John D. Pierce, Founder of the Michigan School System: A Study of Education in the Northwest.* By C. O. HOYT and R. C. FORD. Ypsilanti, 1905. Pp. 162, 8vo.  
 Bibliography, pp. 153-55.

## NATURE-STUDY

"Best Books on Nature Study." (In *Nature Study Review*, May, 1906, Vol. II, pp. 168-77.)

Lists of "ten best books" submitted by twenty-two leading nature-study teachers in response to editorial request. No single book is named more than thirteen times, and only three appear in ten or more lists. The lists are suggestive, instructive, and will repay careful examination.

## NEW YORK CITY—EDUCATION

*The New York Public Schools: Being a History of Free Education in the City of New York.* By A. E. PALMER. New York, 1905. Pp. 440, 8vo.

The author is secretary of the New York City School Board, and the book is authorized by that board. Preface, pp. 21 and 22, contain bibliographical references.

## PHYSICAL EDUCATION

"A List of the Titles of Abstracts, Tables, Statistics, Exhibition Schedules and Other Matters Published by the Department of Hygiene and Physical Education, Amherst College, from 1861-62 to 1905-6 Inclusive." By EDWARD HITCHCOCK and P. C. PHILLIPS. (In *American Physical Education Review*, June, 1906, Vol. XI, pp. 121-30.)

Complete sets of the 200 papers listed are in the Library of Congress, Boston Public Library, the libraries of Clark University, Amherst College, the Society for Physical Research, and in the private libraries of Drs. Phillips and Hitchcock.

A Bibliography of Physical Training. By J. H. McCURDY. Springfield, Mass., 1905. Pp. 36, 8vo.

Published for the Physical Directors' Society of the Y. M. C. A. of North America. The Introduction states the object of the work, "to present a subject index of physical-training literature which will be helpful to physical directors and students of physical training." This programme perhaps excuses the lack of an author index, which is a very useful, almost necessary, adjunct to a classed list of titles. About 6,000 titles (according to a printed prospectus) are classified under a useful scheme embodying 250 subdivisions, the outgrowth of thirteen years' experience with a large collection of literature on physical training. The notation is so devised that it may be used under the number 613.71, which represents this subject in the Dewey decimal classification, which is the system in widest use among libraries. An alphabetic subject index furnishes a key to the scheme, although we consulted it vainly for "roller-skating," "ping-pong," "jui-jitsu," and "swimming-pools." Listing as it does periodical articles, reports, reprints in English and foreign languages, it is undoubtedly the fullest bibliography of the subject ever printed, but it takes more than mere industry and familiarity with the literature of a subject to get together and classify 6,000 titles, and present them acceptably in print. This book cries out for an *editor*, from the misleading binder's title on the back through every one of the 369 pages, which might easily, with competent editorial care, have been put into 250 or less. If the compilers never heard of the canons of good bibliography, it is time they did, and it is remarkable that any first-rate printer would have permitted such a wasteful arrangement, duplication, and display of matter as is shown by the short lines, the repetition of class number with each item and of the same author name through from two to sometimes a dozen consecutive items. Space could also have been saved and a pleasing harmony attained by omitting all honorary titles, by using the well-known abbreviations for months, and by using the more easily recognized Arabic numbers for volumes, instead of the clumsy Roman numerals. Caspar Whitney appears sometimes under that name, sometimes as Casper, and often as C. Whitney. A uniform usage of initials only for forenames would have saved much space and work. The references are inconsistent, often confusing, and there is no key to abbreviations or explanation of the more uncertain combinations. We will defy anybody to untangle the maze of figures, colons, commas, semicolons, periods, and curves which follow the words "Mind and Body" at the head of p. 213; ordinary minds and bodies are not equal to it. The moral to all of which is that, though you may be a good physical director, professor, engineer, or teacher, you would better consult a good bibliographer before attempting a catalogue or index.

## RELIGIOUS EDUCATION

*Literatur-Verzeichniss zum evangelischen Religions-Unterricht.* Von HERMANN MELTZER. 2te Auflage. Dresden, 1905. Pp. 68, 8vo.

The Teaching of Bible Classes, Principles and Methods: With Special Reference to Classes of Young Men and Boys. By E. F. SEE. International Committee of Y. M. C. A., 1905. Pp. 180, 12mo.

Presents the notes of a course of study pursued by classes of young men for several years under the leadership of the author. References for further reading are given at the end of each chapter.

## SCHOOL ARCHITECTURE

*Bibliography of School Buildings and Hygiene.* By W. P. Gerhard (In *American Architect*, July, 1905, Vol. LXXXVIII, pp. 14-16.)

Includes American and German books, periodical literature, and reports, arranged chronologically.

## SCHOOL GARDENS

*School Gardens for California Schools: A Manual for Teachers.* By B. M. DAVIS. Sacramento, 1905. Pp. 79, 8vo. (California State Normal School, Chico, Bulletin 1.)

The bibliography is found on pp. 50-74. References are definite and exact, and the annotations are frequent and useful. School-garden work in many countries is noted. This list is far better than either of the bibliographies noted in the *School Review*, October, 1904, p. 659.

## SCHOOL LIBRARIES

List of Books for School Libraries Prepared by the Oregon Library Commission. Salem, Ore., 1906. 2 parts, 8vo.

Most school-teachers have neither time nor information needed to compile a thoroughly good list of supplementary reading for pupils in the grades and the high school. The need for such lists has been keenly felt as school attendance has increased, as school and municipal libraries have made available larger collections of books, and as educators have more and more agreed to—nay, even insisted upon—free and wide use of good books entirely apart from the regular textbooks and the formal curriculum. To meet this need *state* educational authorities have sometimes printed such catalogues (one of the best comes from the Wisconsin Department of Public Instruction and has gone through several editions); sometimes *city* school boards have undertaken such work (see the great catalogue of the books in the New York city school libraries), with varying competence and success. The trouble with most such lists is that the selection of books is perfunctory or indifferent, and indicates a too ready acceptance of publishers' dicta, and the requisite technical knowledge for making a good catalogue is lacking. The most useful and careful work of this sort, however, has come from library initiative, either independently or with the co-operation of local school people. Sometimes it is the *city* library, as with the *Graded and Annotated Catalog of books for the Use of the City Schools* from the Carnegie Library of Pittsburg; *Class-Room Libraries for Public Schools*, from the Buffalo Public Library; and the similar, shorter list from the Public Library of Evanston, Ill. (that all three of these titles are now, I believe, out of print testifies to the real need for and the quick appreciation of such work when well done).

Again, it is often the State Library Commission (an office now in over twenty states charged with the stimulation and supervision of libraries, much as the superintendent of public instruction cares for state schools) which has issued these lists of good books. The best such have come from Nebraska and Oregon, the latter being the title now under notice at the head of this paragraph, and which in practical usefulness, technical completeness, and careful choice of books included is in many ways a model. Part I (112 pages) is a graded and classified list of 787 titles for the first eight grades, arranged under 45 common and convenient subject headings. Full details and instructions for purchase at fair prices are given, and, better than all else, every title is followed by a descriptive note telling, in from one to ten lines, just what a teacher or prospective buyer wants to know. These good notes, made from personal examination of the books or chosen from competent sources, are next best to really seeing the books before buying. Part II (53 pages) is a similar list of 350 further titles deemed specially useful in high-school libraries. Each list contains full author and title indexes, with various minor features which combine to make the two pamphlets of high value to teachers, librarians of school libraries, and all persons interested in providing approved reading for children, not only in Oregon, but in every other state as well.

## TEACHERS AND TEACHING

*The Education and Training of Secondary Teachers.* By E. C. ELLIOTT, E. G. DEXTER, M. J. HOLMES, and others. Chicago University Press, 1905. Pp. 117, 8vo. (National Society for the Scientific Study of Education, Fourth Yearbook, Part I.)

The following five topics are treated: the genesis of American secondary schools; what constitutes the ideal secondary teacher; the present status and personnel of the secondary teachers in the United States; the present provision for the education and training of secondary teachers; relative advantages and limitations of universities and normal schools in preparing secondary teachers. On pp. 104-6 about fifty titles are grouped according to above subjects; they are well chosen.

*The Principles of Teaching Based on Psychology.* By E. L. THORNDIKE. New York, 1906. Pp. 293, 8vo.

Topics for further study with references, pp. 274-80; sources of quotations, pp. 281-85.

## TRINITY COLLEGE, HARTFORD, CONN.

*Bibliography of Official Publications* [of Trinity College, Hartford, Conn.], 1824-1905. Hartford, 1905. Pp. 42, 8vo. (Trinity College Bulletin, Vol. II, No. 4.)

Chronological lists of charters and laws; annual catalogues; general and quinquennial catalogues; administrative and executive reports; pamphlets, circulars, miscellanea, and other articles about Trinity in books and periodicals. Full title-page collation, paging, and size are given, with an occasional note of some further item of interest.

## UNITED STATES MILITARY ACADEMY, WEST POINT

*The Centennial of the United States Military Academy at West Point, New York, 1802-1902.* Washington, 1904. 2 vols., 4to. (Serial Nos. 4750, 4751.)

Volume II is entirely devoted to the following bibliographical items: bibliographies of West Point 1604-1902, arranged chronologically; of the United States Military

Academy, 1776-1902, arranged chronologically; and of the writings of graduates, 1802-1902, arranged alphabetically. These are followed by a list of graduates of the academy, 1802-1902, with year of graduation and reference to the number in *Colum's Biographical Register*. Included with the first section noted above are extensive lists of views and maps of West Point. The extensive list of writings of graduates is much more than its title suggests, for it includes references to pictures, statues, busts, monuments, etc., all over the country, and references to books and articles *about* as well as *by* each graduate. All sections contain minute references to material in newspapers, magazines, and on certain pages or in single chapters of books.

#### WOMEN, EDUCATION OF

*Contributions towards a Bibliography of the Higher Education of Women, Supplement No. 1.* Compiled by a Committee of the Association of Collegiate Alumnae. Boston, 1905. Pp. 57, 8vo. (Publications of the Association, Series 3, No. 2.)

Supplements the original list printed in 1897 and noticed in the *School Review* for October, 1898. The present list contains all titles found by the compilers, printed during the 6 years, 1897-1902, with a great many of earlier date which were overlooked in the first instalment. Indeed, in many parts the earlier titles are the more numerous. Some titles are repeated in the Supplement when it would seem that the entry in the original bibliography would have been enough. The Supplement is very pleasing in typography, and shows much pains and diligence in its compilation and editing. The two parts are easily the most extensive and useful collection of references on this subject.

#### YALE UNIVERSITY

*Bibliography of Class Books and Class Records 1792-1905, Yale University.* Compiled by WILLIAM P. BACON. New Britain, Conn., 1905. Pp. 18, 8vo.

A list of class books and records which have been printed by the secretaries of various classes in all departments and schools of Yale.

## DISCUSSION

### A NOTE ON FORMAL DISCIPLINE

E. A. KIRKPATRICK

State Normal School, Fitchburg, Mass.

Professor F. C. Lewis' article on this topic in the *School Review* for April, 1905, is an interesting and valuable contribution, but it is not the last word. I do not expect to say the last word, nor do I expect it to be said for many years yet. I wish, however, to suggest a point of view that may be in the direction of a solution of the problem.

Professor Lewis' transference of the general effects of special training from the intellect to the will is, in the judgment of the writer, a partial, but only a partial, solution of the question. Even in the plane of consciousness it is not certain that general intellectual as well as volitional modifications may not be produced by special learning processes. But in these days of research into the subconscious we must recognize that many modifications of mind are deeper and more fundamental than conscious states.

If we take the physiological view-point, light is thrown on the question. Experiments have shown that exercising one arm increases the size of the other, and that increase in sensory discrimination and motor skill is not confined to the portion of skin or the digit exercised, but is shown especially in the corresponding parts on the other side, and to a less extent in other parts, especially adjacent ones. These and other facts support the view that in every reaction, especially in new adjustments, all parts of the nervous system are active, though the chief activity is in certain parts immediately concerned, and in a less degree in other parts closely connected with them, while the activity of other parts is perhaps so small as not to be perceived except by special tests.

Now, all this activity produces effects which result in tendencies or habits. These we might name respectively as special, associated and general habits. In the sphere of mental activity, then, what we have called general habits may be designated as intellectual power or will-power, as one prefers; but in the narrower meaning usually attached to the words both are needed to describe the result. The important thing is to find out what kind of mental acts produce the most general effects. Here is where I wish to give my suggestion for further discussion and experiment.

We have every reason to believe that new acts, rather than those many times repeated, are most effective in this way; for as an act becomes a fixed habit the activity is confined more and more definitely to the special parts needed for its



performance. It is useless, therefore, to expect to prove anything regarding general discipline by prolonged experiments upon special habits, as has been attempted; for the more nearly a habit is formed, the less are the general effects. The more promising field is to study the effect of dealing with a variety of situations upon the ability to deal with new situations of the same and of different kinds.

It seems quite probable that the most marked general effects will be in activities having the same general purpose—research in one line for research in other lines, making money in one industry for making money in others, inventions for other inventions, painting for ability in producing other forms of beauty.

The use of a variety of means for a certain purpose would seem likely to give the whole mind a trend in that direction which would enable it to act more effectively in meeting new situations for the same end, and for analogous ends. On the contrary, if only one mode of obtaining the general purpose is used, the tendency to reach it in other ways decreases, and the individual's activity is more and more confined to the one line.

Experimenters upon animals have been led from their observations to think it probable that an animal that has mastered one set of difficulties in getting out, or into a place where food is to be obtained learns to overcome other difficulties more readily. If this is true in the slightest degree of animals, which have little or no conscious power of generalization, it is probably true in a marked degree of man, who is able to go so readily from particulars to generals. It is in this higher process of learning, rather than in the lower automatic habits, that general effects are to be found, and in which they are probably intellectual as well as volitional.

If this view is correct, there must be considerable modification in the methods by which psychologists investigate the general effects of special activities. A beginning has already been made in the study of learning processes rather than of the practice of what has already been learned. Further study of this question may soon result in conclusions that will wholly modify our educational practices and cause our courses of study to be scientifically constructed so as best to prepare in a general way for life. Perhaps it may be proved that the practical subjects now being introduced in response to popular demand, and justified on economic and sociological grounds, are psychologically well suited to give a general and liberal preparation for life. It is not impossible that the acquisition of practical knowledge of several industries (something that has long been carefully avoided even by pronounced advocates of manual training) may be recognized as one of the best means of obtaining a general and liberal education for the life of today.

Further study will also probably show us just how much justification there is for claiming general training from memory exercises and from exercises involving the going from particulars to generals and from generals to particulars.

Arguments for any form of general training in the future must not merely show what mental activities are called into play, but must prove that such activities produce general effects that increase the student's power to deal with other situations in accomplishing the purposes of the life of today.

It seems probable that a variety of activities fundamentally related would give more *general* power than one general type of activity carried on for many years until what has been learned has taken the form of fixed habits. Fixed habits probably favor practical efficiency more than general mental development. We may find that some forms of thoroughness in education have results exactly the opposite of those claimed and desired by their advocates. On the other hand, the probability of varied training failing to go deep enough in its effects to give any permanent bent to the mind needs investigation.

I certainly agree with Professor Lewis that the subject of general discipline is decidedly a live topic, and one likely to have additional light thrown upon it in the near future, but I do not believe that the whole story can be obtained from consciousness and will; unconscious tendencies and conscious intellectual activities must also be questioned. His emphasis upon the teacher's influence upon the ideals of students is well placed, yet there is still reason to believe that there may be certain general tendencies produced by certain subjects and certain methods independent of the personality of the teacher. He is the most important factor in education, but, as a science, education must determine the nature and degree of general discipline produced by different subjects of study, regardless of who teaches them.

# MATHEMATICS AND THE DOCTRINE OF FORMAL DISCIPLINE

JOSEPH V. COLLINS

State Normal School, Stevens Point, Wis.

The older educators held that discipline acquired in one subject would aid materially in mastering another. Those who defend the opposite view bring evidence to show that knowledge or skill in one thing is little or no preparation for acquiring knowledge or skill in another thing, unless there is an identity of qualities in the two things. A writer in the *School Review* for April, 1905, dealing with this question of formal discipline, undertook to show by experiment that skill in mathematical reasoning is of no value in other kinds of reasoning. His results went to prove the thesis that students' ability to reason in other subjects was inversely proportional to their ability to reason in mathematics. On top of this showing it must be conceded that the actual use to which a knowledge of quantitative relations above the simplest elements of arithmetic is put by most persons is very small. If, then, the mathematics discipline idea is literally and definitively a myth, and skill in perceiving quantitative relations not very important, much of the time now spent on mathematics is probably worse than wasted. Professor Lewis' results, just referred to, ought therefore to challenge the attention of every teacher of secondary and higher mathematics. If this investigator is right, many mathematics teachers ought to be out of a job.

In Professor Lewis' experiments he gave two sets of questions to twenty-four groups of pupils—one of originals in geometry, and the other what might be called originals in general reasoning. A sample of the first was: "Prove that the bisectors of the interior angles of a trapezoid form a quadrilateral two of whose angles are right angles." The others were: "(1) Give all the reasons you can why a high-school education is a good thing. (2) Why should the town rather than the parents pay for the education of its children? (3) Which is of more value, physical or mental training? Give all the reasons you can for the position you take."

After grading the students in each examination, he ranked them in the two kinds of reasoning. The table of ranks given in the article was specially designed to catch the eye and show how those good in mathematics were poor in the other reasoning, and vice versa. His tables can be set down in figures much more compactly and completely in the following way:

TABLE OF RANKS OF PERSONS (p. 290)

Mathematical reasoning .....	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
General reasoning	13	16	9	5	14	18	11	15	7	6	1	8	12	4	17	3	10	2
Differences in rank	12	14	6	1	9	12	4	7	-2	-4	-10	-4	-1	-10	2	-13	-7	-16

The figures in natural order in the first line represent *individuals* as ranked in mathematics. Thus, No. 1 represents the one best in mathematics, No. 2 the next best, and so on. The figures in the second line designate individuals by their numbers in the first line. Thus, No. 13 in the first line is first in general reasoning, No. 16 of the first line is second in general reasoning, and so on. The third-line figures are obtained by subtracting the figures in the first line from those underneath them. *The third-line figures in this way give the number of points of superiority in general reasoning over mathematical reasoning of individuals arranged in general reasoning order, the best first.* Thus the first in general reasoning was 12 points below this, or thirteenth in mathematical reasoning, the second in general reasoning was 14 points below this rank in mathematical reasoning, or sixteenth; and so on. The negative numbers give the number of points of superiority in mathematical over general reasoning. Thus the ninth in general reasoning was 2 points better, or seventh, in mathematical reasoning. Now, for present purposes, since we do not care for the standings of individuals, the third line tells all we want to know. We will therefore give the tables to follow in this form. Had Professor Lewis chosen to use this form, he might have put down all of his thirty-four tables in the same space he took for the two he gave.

The striking thing about the third-line figures is that they are so large. Had these eighteen students been arranged in general reasoning in exactly the reverse order to that of their mathematical ranking, giving a maximum of differences in ranks, the sum of the figures in the third line would have been 162. Actually the sum was 134. Now, the writer's observation has always been that, while some students were good in mathematics and poor in other subjects, there was a large percentage who were either good in mathematics and good in other subjects, fair in mathematics and fair in other subjects, or poor in mathematics and poor in other subjects. He determined therefore to make a little study on his own account of this question.

In his first and second tests he asked eight instructors in the same school to rank in percentages, *in reasoning power only*, certain students. The average of these markings was taken, and the students were ranked in their ability to carry on miscellaneous kinds of reasoning. The same students were then ranked by taking their marks in mathematics as set down in the records of the school. (It should be added here that originals form a considerable part of the work and of the examination in geometry.) The first set of students ranked were of the maturity of sophomores in college, and the second set of senior preparatory students. Still another table was prepared, after the fashion of that formed from Dartmouth College grades, by contrasting mathematics grades with the average in United States history and commercial geography. These latter subjects were chosen because the burden in the teaching of each was laid not so much on the facts as on seeing the relations between the facts studied. The teachers of these subjects thought that fully 75 per cent. of the work consisted in what was this kind of reasoning.



On comparing Professor Lewis' tables with the others, one sees immediately a marked difference. His sums are high as compared with the maximum, while the other sums are comparatively low. Indeed, the results are almost exactly opposite. The class that was abnormal in Professor Lewis' tables becomes the normal one in the other. The latter tables show that, with the exception of about 20 to 25 per cent. of erratic people, those good in mathematics are good in other subjects, those of average ability in mathematics are of average ability in other subjects, and those poor in mathematics are poor in other subjects.

Such contradictory results raise the question of how it could have happened. Various explanations might be advanced. One is that the sharply drawn examination test and the classroom test would be likely to give different results. Doubtless this would make some difference, but it is not very satisfactory as an explanation, since every teacher of mathematics knows that, as a general rule, those good in term work will be good in an examination, no matter whether the examination contain originals or regular propositions. Some other explanation seems necessary.

Professor Lewis says: "Precisely this striking result [*viz.*, ability to reason on practical things varies inversely as ability to reason in mathematics] is discovered in the other twenty-three tests." Having watched the operation of the great law of chances in the happening of events, the writer finds it hard to believe this to have happened without there being some explanation other than the one assigned. Possibly the rankings in the other twenty-three groups were examined only casually. If so, it would be easy to conclude that they were similar, whereas they might be really quite different. A total of 134 in a maximum total of 162 is a large number to have happened in each set. The writer does not, of course, challenge the figures given by Professor Lewis in any way, but thinks there may be some explanation to account for what seems to him remarkable coincidences in the results. It is barely possible that the examiners were prejudiced against certain forms of argument in the general reasoning which those mathematicians inclined would be likely to employ.

However, what seems to the writer a much more plausible and satisfactory explanation is a difference in courses. The best preparation for writing on the general-reasoning questions given above would not be a course in mathematics, but a current or recent course in theme-writing. If, in addition to this, one set of students had had a recent course in some subject which would equip them with data concerning general educational questions, they would have a great advantage over others. A moment's reflection will convince anyone that the general effect on an examiner's mind from reading a paper which tested for practical reasoning would depend vastly more on the student's knowledge of data concerning the topic than on his ability to draw formal conclusions correctly. This being true, one could not feel very well satisfied with any conclusions drawn, unless he knew details of the education of the students examined, especially as regards differences of courses or opportunities of general culture. Thus, what



seems at first blush the best test possible by which to judge students as regards their reasoning powers may turn out to be a very poor one. Every experimenter in physical science knows it is often failure to consider some unsuspected detail that vitiates entirely what promised to be important results.

It can be urged, on the other hand, that the tests in reasoning in a variety of subjects for a considerable period of time are likely to furnish a better means of judging students' reasoning power than two diverse and highly specialized examinations. Examining students on a variety of subjects with the materials furnished, by letting them take a course in a subject ought to be a fair test. A very large number of students have been tested in this manner, the results being given in Thorndike's *Educational Psychology*, chapter iv. These results show that mathematics is very often closer to other studies (coefficient of correlation greater) than they are to one another; and, as a rule, if a student is above the average in mathematics, he will be above the average in his other studies.

Out of this discussion comes back to us, then, the question: Does the training in mathematics aid in other reasoning and in the affairs of life? The world in general, and the educational world in particular, says it does, and lays down extended courses in mathematics in all schools. But may not this be a wrong view to take, as Professor Lewis seems to urge? When a student is good in mathematics and good in general reasoning, which is cause and which is effect? Both, or one, or other, or neither? It was Mr. Dooley—was it not—who said in some connection: "Cause and Effect, are they the same? Yes and no."

The present study has no direct bearing on the "faculty" theory of psychology, but purposes merely to show that a relation does exist between ability in mathematical reasoning and general reasoning. As Professor Lewis points out, the existence of such a relationship does not prove the faculty theory true. The tables of the present article seem to show that what a student does in any subject depends more on native endowment and presentation than on the matter considered. It is the native endowment and acquired skill of the pupil that enables him to digest well and be nourished by any intellectual pabulum set before him.

Mathematics gives a training *sui generis*. In arithmetic the problems correlate at many points with the actual affairs of life. Speaking broadly, the most important effects of the mathematical training are abilities of quite general application: as, holding a number of particulars in the mind at one time; training in sustained reasoning; habit of overcoming difficulties; recognizing the universality of the application of correctly stated laws; perceiving the need of care to secure the accuracy of results required; and so on. These powers have identity of qualities with multitudes of activities in which the individual finds himself engaged in after-life. They thus furnish hooks on which to hang new experiences and conquer new problems. In these ways, perhaps more than in any others, mathematics justifies its place in the course.



## EDITORIAL NOTES

Principal J. Stanley Brown, of the Joilet (Ill.) Township High School, reports with satisfaction the case of the first of the graduates from the six-year high school course, who has received the baccalaureate degree from college on the completion of two years of residence work. He says:

THE SIX-YEAR  
HIGH SCHOOL  
AT WORK

—— graduated from our high school from the regular four-year course with an average standing of about 85; she afterward took two years' additional work, represented by our fifth and sixth years, and for this work received credit without examination or condition on her entrance at —— College, September, 1904. She graduated in June (1906) with a very creditable record in all her college work. . . . Without exception the departments at —— College speak highly of the record which she has made. Miss —— is the first of our students to complete our six-year high-school course and to graduate from college in two years. She could not have attended college four years following her graduation from high school because of financial conditions. In her case is shown the completion of what Dr. Harper worked for in the conference. In my mind, it represents a bit of distinct educational progress of the year. I feel satisfied that the number of people who go to college knowing that they may complete their college course in two or three years is very largely increased by reason of the fact that the extra year or two can be done here. The tendency here is unquestionably to prepare students (in the high school) to enter the senior college in a course in literature and arts, or the best colleges of law, medicine, or engineering.

A number of private secondary schools are offering courses covering the first two years of college study (the junior college). The public high schools are likely to encounter considerable difficulty in doing this because of the increased cost involved for the necessary equipment and teaching staff. The maintenance of the state university at public expense operates in the same direction as does also, though perhaps less strongly, the tradition in favor of the "small college." Nevertheless, the movement toward the secondary school affording, in addition to the regular four-year course, two additional years of "preparation for life," and articulating directly with the university (in distinction from the college), is slowly but steadily progressing. It is obviously not to be desired as a general modification of the American high school. Probably an attempt to extend the high school in this way forcibly will always be defeated. Separate communities, and especially industrial communities, are likely, however, to demand it. The extended high school seems to justify itself wherever it is in actual operation. In Goshen, Ind., where the plan is thoroughly in operation, the modification of the high school has received popular approval, as is attested by the following note received by President Harper, of the University, shortly before his death, and signed by the Board of Education of Goshen:

We wish to assure you that the institution of the six-year high-school plan in Goshen is permanent, and has the entire support of the board of education, and the hearty approval and patronage of the citizens. We wish to state further, that we will do all we can toward placing the last two years' work on such a plane as will entitle pupils to college recognition.

It has recently been suggested from several sources that a section of the *School Review* might profitably be devoted to brief and informal discussions of recent articles published in this journal and of other matters of educational interest. In the words of one of the advisory editors of the *School Review*, such a department of discussion "should offer a field for people to have their say in definite, clean-cut, brief discussion of important, everyday questions in education. Of course, its success will depend on whether the thoughtful members of our profession can be led to use it."

There is abundant evidence that articles published in the *School Review* have stimulated comments from readers which might well have been directed to a department of discussion. Contributors have volunteered instances in which the publication of an article in the *School Review* has been followed by the receipt of numerous letters of comment and inquiry, sometimes coming from a wide range of territory and indicating a live interest in the views expressed in the article. The editors have also received from time to time similar letters from readers of the journal.

It is confidently believed that many readers would make use of a section in the *Review* which should be given over to brief and informal discussion—to the more immediate and personal reaction to positions taken in recent articles, or to the expression of points which are not sufficiently complex and detailed to demand the range and epic swing of an article. Accordingly, under the heading of "Discussion," two somewhat extended comments on the recent article by Professor F. C. Lewis, on "A Study of Formal Discipline," are published in the present issue of the *School Review*.

The continuance of this department of Discussion depends, of course, upon the suffrage of contributors. It may lead for some time an intermittent and fugitive existence, flowing like a subterranean stream entirely below the surface of several issues of the *Review*, and reappearing perhaps at irregular intervals. At all events, readers of the *School Review* may be assured that briefer and more informal comments likely to be of interest to other readers will be provided for, so far as practicable, in these pages.

A DEPARTMENT OF  
DISCUSSION AND  
CORRESPONDENCE

## BOOK REVIEWS

*A First Course in Physics.* By ROBERT ANDREWS MILLIKAN AND HENRY GORDON GALE. Boston: Ginn & Co., 1906. Pp. vi + 488.

A new high-school textbook in physics is not in itself a very notable event these days. The shelf containing these elementary textbooks will soon have to be enlarged if the present rate of appearance of them continues. But there will always be a place for a good elementary book in physics. The increase in the number of such books is not a criticism of present textbooks, but rather shows that, as physics is taught more in the schools, it is found that no single book can satisfy all schools. The conditions of different schools and different teachers call for different books. The present book has grown out of the needs of a number of secondary schools affiliated with the University of Chicago, as we learn from the preface. It is certain to take its place as one of the best of our elementary textbooks. It shows on every page that it is not a mere compilation, but a carefully prepared and fresh presentation. The most recent views of physics are presented in a clear and interesting way. These new views are not tacked on at the ends of the chapters here and there, but are component parts of the presentations and discussions. Thus in electricity, the subject is presented from the electron point of view at the very start, so that the student's whole idea of the subject is formed on that theory. There may, of course, be danger for the young student in such an incorporation of "the newest points of view," for no man changes his views so rapidly and radically as the modern physicist. The authors of this book have, however, been conservative, and have avoided freak theories. A striking feature of the book is the great number of facts given from modern industrial and engineering practice. Thus the types of water-wheels are described and their efficiencies are given in numerical percentages; the types of house-heating systems are explained; ice-machines and cold-storage houses are described with diagrams; a modern telephone circuit is figured; the arrangement of the blades of a modern steam turbine is shown in diagram, and even the speed of turbine steamships is stated with the date of the trip of the vessel that made the record. This encyclopediac knowledge is of course only a small part of physics, but it adds interest to the subject for the live boy. A commendable feature of the book is the series of excellent portraits of the men who have contributed most to physics. The short legends under these portraits, telling what each man did for the world, are very good. The topics treated are those usually found in an advanced high-school text. It is intended that the book be used in connection with a manual of laboratory experiments by the same authors. Frequent reference is made to this laboratory manual, but the manual has not yet been published. The dependence of the textbook upon a special manual (and at times the dependence is vital), is in our judgment a defect for the general use of the book. The book is presented as a course for third-year high-school students. The treatment is not mathematical and is in general very clear. The large high schools with special teachers of physics will find the book not beyond their students, but some schools may have difficulty in properly covering in one year as much as is presented

here. But, as the authors state, omissions must be made. The print and illustrations are such as to add to the attractiveness of the book. The book is certainly one of the best of our high-school textbooks in physics.

A. P. CARMAN

UNIVERSITY OF ILLINOIS

*Introduction to General Inorganic Chemistry.* By ALEXANDER SMITH. New York: The Century Co., 1906. Pp. xviii + 780.

This book is intended for use in a college or university. The subject is treated in a masterly manner, and the subject-matter up to date. The method of treatment shows that it has been written by a teacher who understands the psychology of teaching. It cannot be said, however, to be an "easy book." The author admits in the preface that it contains some "stiff" reading. The beginner in chemistry will need much laboratory work, and considerable explanation from his teacher in conjunction with the text. The book will be particularly useful to the student who has had a previous elementary course in general chemistry. The hypothesis of ions underlies the whole treatment. Theory receives the principal consideration, and great detail in explanations is a feature of the work.

The first four chapters are introductory, and deal for the most part with the various general characteristics of chemical phenomena, the fourth chapter being confined to symbols, formulæ, and equations. Chapters five to thirty-one inclusive deal with the non-metallic elements, together with chapters on the gas laws, the kinetic-molecular hypothesis, solution, molecular and atomic weights, the atomic hypothesis, chemical equilibrium, dissociation in solution, electrolysis, and the chemical behavior of ionic substances. The last fifteen chapters deal with the metallic elements, together with part of a chapter on chemical equilibrium considered quantitatively, and one chapter on electromotive chemistry.

The book is doubtless the very best of its kind and will be found to be particularly strong on explanations in connection with the hypothesis of ions. This, of course, includes much of the book. It is not intended as a reference book. As a textbook of general inorganic chemistry the reviewer knows of no other in which the theory is so thoroughly treated. Several valuable tables are to be found in the book such as those on solubility of compounds; degree of ionization of acids, bases, and salts, and the electromotive series of the metals.

A few minor points that should be corrected in a future edition have attracted the notice of the reviewer as follows: on p. 50 the words "by weight" should doubtless be added to the definition of "equivalent weight." On p. 69 formulæ are derived from the calculated proportional number of atoms in the molecule, the vapor density not being considered, whereas on the next page in the case of phosphoric anhydride the vapor density is taken note of. To the thoughtful beginner the question of the vapor density of sulphur dioxide, p. 69, would probably arise. On p. 72 the definition of "reduction" is not satisfactory for a final definition. On p. 351 the equation in the paragraph on neutralization is not balanced. It seems to the reviewer that more use might have been made of the hypothesis of ions in helping the student to learn to write equations. The writing of equations is a source of trouble to practically all students of chemistry. In cases of double decomposition, especially, if the student is taught to divide the formulæ on the left-hand side of the equation so as to indicate the ions, with their proper signs, and then to indicate

on the right-hand side of the equation the combination of positive and negative ions into pairs, taking proper precaution as to valence he will find it a great relief in the work of making equations.

The book as a whole is a splendid production, and although it may never be found to be adaptable to high-school classes on account of its advanced nature and its university-lecture style, it will be invaluable to the high-school teacher who wishes to be up to date on theory and hence in a position to make his instruction of a fresh and vigorous nature, and there is no reason why it should not be the standard general textbook on inorganic chemistry for college and university classes.

W. O. WALKER

ARMOUR INSTITUTE OF TECHNOLOGY

---

*Practical Mathematics.* By A. G. CRACKNELL. 3d ed., Longmans, Green & Co., 1904. Pp. viii + 378.

This volume is one of many recently issued in this and other countries in the common attempt to bring more practically within the comprehension of students the usefulness of mathematical studies. This attempt is finding expression in all grades of work from the most elementary to the highest college and university courses. The so-called Perry movement in England, being originally an effort on the part of Professor Perry and others to make the training of engineers less theoretical and more practical, has influenced all phases of mathematical teaching in that and other countries. An equally significant movement is taking place in Germany led by Klein and other university professors.

The volume under consideration includes topics in arithmetic, such as fractions, short methods of multiplication and division, powers, roots, etc.; in algebra, such as the elementary operations, factors, fractions, equations, radicals, logarithms, etc.; in geometry, such as areas, volumes, graphical area, areas by squared paper, proportion, etc.; and in trigonometry and plane and solid analytic geometry. Many principles of the calculus are also included by means of illustrations and exercises, but no formal presentation of the calculus is given. Indeed there are no proofs of any kind given in the book and no development of theory—only statements of facts and foundations of rules, together with sample solutions, and an abundance of exercises for practice in following out the rules. In the author's words: "The object of the book is to develop in the student a clear and accurate conception of the more useful principles of elementary mathematics. For this purpose it is certainly not necessary that the student should master the complex scheme of rigid argument from which these principles are ultimately deduced; for example, the sixth book of Euclid is in no way essential to an accurate practical knowledge of the properties of similar figures." Otherwise stated, the time and energy usually given to demonstration of principles and development of theoretical knowledge is here devoted to the numerical, mechanical, and graphical interpretation and verification of given statements. Much emphasis is given to numerical computation, especially with logarithms, to the use of the slide rule, the diagonal scale, the protractor, the dividers, the planimeter, and every device usable in an elementary and practical manner to see and get results. Special stress is laid upon the interpretations of observations and the translation of data into formulæ by numerical and graphical methods, and all processes are abundantly illustrated by examples fully worked over and explained in the text and followed by numer-

ous exercises, for all of which answers are given with the degree of numerically accurate approximation stated in each case.

Without doubt the teaching of mathematics in the present generation has embodied an extreme degree of formal theory and proof and all too little of contact with practical things. It is, however, an open question whether the exclusive use of a text like this one under consideration will not lead to the opposite extreme and tend to produce a generation of mechanical manipulators, who can work by the rules but who have no foundation of knowledge upon which to make rules for themselves or to work out along independent lines. It seems evident that both demonstrable knowledge and practical skill are necessary and that these should be developed simultaneously. Such a text as this may well be thrust into the present one-sided situation in order to restore the balance, but the ultimate result is likely to be the more equal blending of the two extremes.

H. E. SLAUGHT

UNIVERSITY OF CHICAGO

---

*Essentials in English History.* By ALBERT PERRY WALKER, in consultation with ALBERT BUSHNELL HART. New York: American Book Co., 1905. Pp. xlii + 550.

This book is in many respects an ideal textbook. The author has been very successful in eliminating unessential details and presenting only the leading issues of English history. The book is well adapted to the needs of high-school students and bears evidence to the fact that the writer, unlike a number of other authors of similar texts, has had experience in teaching pupils in secondary schools and does not aim above their heads. It is not a dry compend of facts, but a clear and interesting portrayal of the life and civilization of the English people from the earliest beginnings down to the present. The facts are well correlated; the author nowhere loses himself in meaningless details but constantly emphasizes the broad lines of historical development. He has been especially fortunate in his treatment of life and manners, of social, economic and intellectual progress. The chapters on the Tudor period are the weakest part of the book. The Reformation and Renaissance movements are inadequately presented. It is strange that in the description of the Reformation the name of Luther should not even be mentioned. The evolution of the Cabinet system might also have been more fully described. The author is at his best in his treatment of the modern period. The concluding chapter on England's contribution to civilization is especially commendable.

The book contains thirty-eight brief chapters: one for each week of the school year. The account is continuous, topical headings being placed in the margin. Helps to further study in the form of references, topics, bibliographies, and extracts from important documents add value to the volume. The maps and illustrations could hardly have been better chosen.

GEORGE L. SCHERGER

ARMOUR INSTITUTE OF TECHNOLOGY

---

*Essentials in Mediæval and Modern History.* By SAMUEL BANNISTER HARDING, in consultation with ALBERT BUSHNELL HART. New York: American Book Co., 1905. Pp. xxxi + 612.

This text, in accordance with the suggestion of the Committee of Seven, begins



the account of the mediæval period with the year 800 A. D., and aims to give the essential facts in the history of Europe since that date. It is a book that deserves hearty commendation and one which in the hands of a capable teacher should yield excellent results. Like the other books in this series of history texts the mechanical features, such as paper, type, binding, and illustrations, are of the highest order. The maps in particular are excellent. The helps to further study in the form of topics, references, and bibliography, are judiciously selected.

In point of scholarship little or no fault can be found with the book. It shows everywhere extensive reading, good judgment and happy characterization. Quotations from the best primary and secondary sources are aptly interspersed. The style in general, is clear. There may be some doubt, however, as to whether the author has always kept in view the needs and attainments of pupils in the secondary schools, for whom the text is intended. Now and then he has the tendency to crowd together too many details. By omitting entirely the account of the reigns of the less important French and German rulers and by eliminating a number of relatively unimportant points, more space might have been gained for elucidating the more important movements. The fine chapters on the church in the Middle Ages and life in the mediæval castle, village, and town occasion regret that the author did not devote more space to institutional development, especially in the modern period.

On the whole, the book is one of the most attractive and satisfactory texts on the subject now available.

GEORGE L. SCHERGER

ARMOUR INSTITUTE OF TECHNOLOGY

---

*The Art of Geometry.* By ARTHUR LATHAM BAKER. Boston: Sibley & Co., 1905. Pp. v+48.

The science and logic of geometry are given in the current textbooks. It is the purpose of the author of *The Art of Geometry* to present a systematic method of procedure which will enable the student to understand the reason for each step in the study of a proposition, other than its logical correctness, and which will serve as a guide to enable him to attack original exercises with confidence in his ability to solve them. Following a brief introduction, which consists principally of definitions, there is given a summary of geometric tools, also a list of suggestive combinations, and another of construction tools which are frequently used. The subjects of other chapters are the "Art of Demonstration," "Art of Construction Problems," "Syllabus of Propositions," and an Appendix on "Plane Geometry."

The reviewer submits two specific criticisms on the book: The matter is presented in language unnecessarily lacking in simplicity and clearness. For instance: "The ascertainment of the Dominant Operation shows the specific goal, etc." What is the advantage of the term "dominant operation" when the geometries use the simpler one, "to prove that" or "to construct." Again, "the technique of geometry consists in the intelligent and purposive use of these tools;" "Plane Geometry is the science of those metrical continua which are generated by the conjunction of straight lines in a plane;" "These four things constitute the sole agenda of plane geometry."

*The Art of Geometry* is a tool for the solution of geometrical exercises. As such it seems to the writer altogether too complex to be effective. Let the teacher of geometry constantly keep before the minds of his pupils the thought that they must constantly search for the geometrical images suggested by what is given and what is to



be proved in the exercises, and that these images are the tools with which they have to work. This together with the suggestions of the ordinary geometry for the solution of exercises will, in the judgment of the writer, prove much simpler and more effective than the system developed in *The Art of Geometry*.

A. F. AMES

PUBLIC SCHOOLS,  
Riverside, Ill.

*Nature and Health.* By EDWARD CURTIS. New York: Henry Holt & Co., 1906. Pp. ix+313. \$1.25.

Dr. Curtis has modestly characterized his little work, *Nature and Health*, as a *lure* to right living rather than as a learned work on the subject of hygiene. He has succeeded, however, in presenting many modern scientific considerations in a most pleasing and telling fashion. The discussions of heating, ventilation, eating, and drinking are particularly good and contain many helpful points that are commonly unknown or neglected. The very simplicity and straightforwardness of the style lends force to the statements—and the suggestions are practical and easily followed. The treatment of the hygiene of the special senses, clothing, exercise, etc., compares very favorably with the best of the minor works on general hygienic. The book as a whole is characterized by accuracy of statement, clear discussion, and practical suggestion, and it is a welcome contribution to an important subject.

J. E. RAYCROFT

UNIVERSITY OF CHICAGO

*Initiation Mathématique; ouvrage étranger à tout programme; dédié aux amis de l'enfance.* By C. A. LAISANT. Paris, 1906. Pp. vii+167, 97 figs.

In this work the writer, already well and favorably known in America through his earlier books on the teaching of mathematics,<sup>1</sup> puts into more concrete shape some of the ideas previously advanced.

As indicated in the title, the present work will fit no course of study and yet, thoughtfully read and assimilated, its contents and its spirit would be valuable in the instruction of every course of study. The table of contents might lead one to think: "Here is another collection of the traditional mathematical recreations," and a casual glance through the little book might disclose enough resemblance to old friends, in topics, cuts, and treatment, to seem to warrant this thought. But closer examination will show that no greater mistake could be made, that we have to do here with a work whose purpose is far more serious and which aims to play a far more essential part in instruction than do mathematical recreations. As ordinarily understood, the latter entertain the pupil by showing him how the theory that he has already mastered may be applied to games, puzzles, and curious problems of various sorts. Mr. Laisant, on the other hand, has advocated in his earlier works that the mathematical beginnings should be made in the child's plays. Consequently, he here presents entertaining or amusing questions which the child can take up without any previous knowledge (of what is particularly involved in that problem), and so chosen that the child while engaged in satisfying his own curiosity or in some sort of play, more or less unconsciously, but clearly, forms a new and important mathematical concept, or discovers

<sup>1</sup>*La Mathématique; philosophie enseignement*, Paris, 1898; and *L'éducation fondée sur la science* Paris, 1905. For a discussion of a portion of the latter see *School Review*, March, 1905.

a mathematical relationship. The sixty-four problems taken up range from the process of counting up to ten, through the four fundamental operations, fractions, the elementary geometric forms, to various progressions, permutations, the conic sections and their equations, and magic squares. They do not form any connected theory, but still are arranged in well-ordered sequence.

The work is not intended for pupils, but for teachers, and is replete with pedagogic suggestions, the fruit of the writer's many years of experience and thought on these lines. American teachers, both in grades and high schools, may well draw on this little book for material to lead up to development of occasional topics.

J. W. A. YOUNG

UNIVERSITY OF CHICAGO

---

*Algebra for Secondary Schools.* By WEBSTER WELLS. Boston: D. C. Heath & Co., 1906. Pp. x+462.

This book includes chapters on progressions, application of undetermined coefficients to expansion of fractions, separation into partial fractions and reversion of series, logarithms, permutations and combinations, and a few pages on exponential and logarithmic series. The various topics are taken up in the usual order and the treatment is in the main that of the general run of textbooks. On pp. 3-7 are several "examples to illustrate the use of algebraic symbols in the solution of problems." Formal work is then taken up and no problem is introduced until p. 57 is reached. It is a satisfaction to note that the reasoning in the earlier portion of the book is less abstract, such discussions being postponed until a later stage of study. Such topics as H. C. F. by the division method, binomial theorem for positive integral exponents, the fundamental laws, remainder theorem, symmetry, equivalent equations, synthetic division, indeterminate forms, are placed at the close of the book. An excellent index adds greatly to the usefulness of the work.

Evidently the cry of the teachers of physics has been heard, and an attempt made to still it if not to satisfy it. A few physical problems and formulæ have been added here and there, but they seem more like patches than a part of the woven cloth. Among the formal exercises in transformations, other letters than  $x$ ,  $y$ ,  $a$ , and  $b$  are frequently used. But when it comes to the study of the equation, the  $x$ - $y$  method is almost constantly used. The equation as used in geometry is not even hinted at.

In compliance with a growing demand, the graph has been introduced, but always at the close rather than at the beginning of a discussion of equations of two or more variables (the author uses the time-honored term "unknown"). If the graph is to be of service in straightening out the intricacies of simultaneous equations, it should come as a rising sun to throw light upon them rather than as an afterglow in sweet memory. Unless the graph can be made an integral part of the subject, and it has been abundantly proven that it can, it had better be left out.

It is necessary to call attention to certain looseness in definitions that mars the book. The L. C. M. is defined as "the common multiple of lowest degree," and it is said that if there are numerical factors the least should be taken; thus,  $4x-2$  is made the L. C. M. of  $4x-2$  and  $6x-3$ , which does not agree with the use of the L. C. M. in the reduction of fractions to their lowest common denominator. We are told that "to factor an expression is to find two or more expressions which, when multiplied

together, shall produce the given expression." This is not in accord with the facts, as is shown by the very illustration used by the author:

$$5a(x-y) - 3a(x+y) = 2a(x-4y)$$

We find such curious terms as "fractional linear equation," "fractional quadratic equation." How an equation can at the same time be linear and fractional is, indeed, a poser! That same half-truth which is forever turning up is given further currency: "If the same expression be added to both members of an equation the resulting equation will be equivalent to the first." How about

$$x = 3.$$

$$x^2 + x = 3 + x^2 ?$$

Of what use is it to prove the theorem: "A quadratic equation cannot have more than two different roots." Any bright boy will say at once "May it not have any number of equal roots?" The emphasis placed on the word different implies that there may be.

The manner in which a subject is presented is often a matter of taste. The author treats variation from the viewpoint of proportion, rather than that of functionality, which is rapidly growing in favor with mathematicians and physicists alike. He retains the almost obsolete symbol  $\infty$ . It would seem better to write  $y = mx$  at once. It is to be regretted that the author has made so little use of the idea of functionality. The treatment of inequalities would be more satisfactory if the solution of the important type  $\frac{n-3}{n-2} > n-1$  were considered.

It may be said in general that the book is built on the older and more conservative lines. It contains a large number of new and interesting exercises. The treatment is direct and within the capacity of the secondary student. It does not, however, satisfactorily meet the demands of many teachers of mathematics who are striving toward a more living presentation of the subject.

CLARENCE E. COMSTOCK

BRADLEY POLYTECHNIC INSTITUTE,  
Peoria, Ill.

*Aus deutschen Lesebüchern, Epische, lyrische und dramatische Dichtungen, erläutert für die Oberklassen der höheren Schulen und für des deutsche Haus.* Band IV, Abteilung I: Epische Dichtungen. By O. FRICK UND FR. POLACK. 4. Auflage. Leipzig und Berlin: Th. Hofmann, 1906.

Every teacher of German should know three large publications which appear at present and rank foremost among pedagogic works on German literature. They are: Johannes Meyer, 1. *Aus der deutschen Literatur*; 2. *Einführung in die deutsche Literatur* (Berlin: Gerdes und Hodel), *Handbuch des deutschen Unterrichts an höheren Schulen*, herausgegeben von Adolf Matthias (München: O. Beck), and the publication under whose title this review is written.

Meyer's *Aus der deutschen Literatur und in die deutsche Literatur* contains numerous selections from all periods of German literature, and appears in single booklets, costing 1 M. each. Thirty-six numbers have already been published and there will be about eighty altogether. Matthias' *Handbuch* will comprise, when finished, fourteen volumes, three of which are out by this time.

Larger than the above mentioned publications is the collection called *Aus deutschen Lesebüchern*. It contains a thorough commentary to all the German literary

masterpieces which are or may be read in schools. This publication is as yet unfinished. Ten volumes have been issued, some in various editions, and at least five others are promised. The volume which is devoted to German epic poetry is the fourth one of the series and appears in its fourth edition. It is a commentary, adapted to the needs of the teachers, treating the "Nibelungenlied," "Gudrun," "Parzival," "Der arme Heinrich," "Das glückhafte Schiff von Zürich," "Der Messias," "Der Heliand," "Hermann und Dorothea," "Der siebenzigste Geburtstag," and "Reinecke Fuchs." For the secondary-school teacher probably only "Hermann und Dorothea" would come under consideration in this volume, but he will find in the other volumes many treatises which are of immediate value for him.

A. C. VON NOÉ

UNIVERSITY OF CHICAGO

*Readings in European History.* By JAMES HARVEY ROBINSON. Abridged Edition. Ginn & Co., 1906. Pp. xxxiv + 573.

This book is an abridgment of the author's two-volume work of the same title. Many extracts have been omitted from the original collection, and others have been cut down. The extent of omissions may be seen from the fact that of the 230 extracts given, in the first volume, on the mediæval period, 94 are retained. Of the 275 in the second volume, on the modern period, 160 are retained. Good judgment has been used in the abridgment, but the omission of so many important and interesting extracts is a cause for regret. Where Robinson's *Introduction to the History of Western Europe* is in use as a textbook, or even another text, the abridgment should be in the hands of every pupil. The book fills a long-felt want and should meet with a large sale.

M. W. JERNEGAN

UNIVERSITY OF CHICAGO

*Cæsar, Gallic War, Books I-V.* Edited, with an Introduction, Notes, Synonyms, Word-Groups, and Vocabulary, by HAROLD W. JOHNSTON, PH.D., Professor of Latin in the Indiana University, and FREDERICK W. SANFORD, A.B., Fellow in the University of Chicago. Boston: Benj. H. Sanborn & Co.

None of the features of this volume are startlingly new, but they are the very features which the practical teacher would desire, and are in every instance worked out with care and accuracy. The text, with few exceptions, is that of Meusel's school edition. Words occurring more than once in Books I-V are printed in heavy-faced type at the place of their first occurrence. The introduction presents the usual information regarding Cæsar's life, and regarding military and Gallic antiquities, in a form which the student can easily consult and master. The notes are concise and accurate. At the end of the notes on each chapter of the Helvetian War, and throughout the second book, there are questions relating to principal parts of verbs, and to case and mood constructions, which will be found very helpful. The vocabulary is sufficiently full and is well presented. There are also lists of synonyms, and of related and contrasted words, like those in D'Ooge's *Cicero*. The book is well made and well illustrated.

While the editors are no doubt correct in their estimate of the fifth book as interesting material for the young student, one can but protest at the omission of the fascinating story of the Vercingetorix.

J. RALEIGH NELSON

LEWIS INSTITUTE, CHICAGO

*Practice Book in English Composition.* By ALFRED M. HITCHCOCK, Hartford Public High School. New York: Henry Holt & Co.

From the first page to the last it is evident that Mr. Hitchcock's book is a thoroughly practical one. Its style of treatment is so completely lifelike that one feels one's self listening to the classroom teacher rather than reading a text. All seems to grow out of a teacher's experience, so adaptable and well timed are the suggestions. It is plain that the author expects instruction and drill to be more useful than theory or complete reference. In the preface he declares for a textbook, plain, practical, and sufficiently varied in contents to provide training in both oral and written work, yet not a complete rhetoric nor a complete manual of composition.

In a review of this sort, since courses in English are less definite than many others, it is interesting to note just what goes to make up the contents of a book on composition. The material is here arranged on the two-part plan; the first, suggestions for practice in the different kinds of composition, and the second, a treatment of practice work in correct mechanical forms. The author is happy in his definite purpose to treat in both parts matter which will answer the pupil's questions: "What is the matter with my composition?" "How can I correct it?"

In Part I the order of arrangement would seem to presuppose on the part of the pupil more knowledge of simple exposition than of description. The complete order of narration, exposition, description, and argument can certainly be safely followed, although the parts are sufficiently independent to admit of other arrangement. Letter-writing follows these and receives its proper portion of attention.

From the short illustrations presented—and one is charmed with their clearness—the essential points are unfolded in the brief discussion which follows. These points are applied in the composition exercises suggested.

Part II in its practical applications transfers the emphasis from the usual unit, the paragraph, to the sentence, where common difficulties are extensively treated under unity and coherence. Punctuation is presented as conducive to clearness, if used in moderation. The few common rules of spelling which are most helpful are given with numerous examples of their application. The troublesome verbs receive the usual notice, and the very unique subject of correcting proof is introduced.

Certainly the selection of topics throughout the book and the distribution of emphasis will please the teacher who feels that in recent times there has been much in composition left to be unconsciously imitated from models beyond the grasp of the pupil, and that scarcely enough attention has been given to the mechanical features of correct English.

E. R. COLLINS

IOWA CITY HIGH SCHOOL

---

*Lingua Materna: Chapters on the School Teaching of English.* By RICHARD WILSON, B.A. LONDON: Edward Arnold; New York: Longmans, Green & Co., 1905. Pp. 208.

This book is written for the use of teachers of "English" in the elementary and the secondary schools of England. The author concerns himself with direct instruction in the mother-tongue, dividing the subject into three sections: (1) grammar and word-study; (2) composition, written and oral, and including paraphrase and *précis*-writing; (3) reading and the study of literature. The elementary character of some

of the author's suggestions will be a surprise to one who has the impression that the teaching of English has long been an advanced and fine art in these schools. The author assumes the contradictory of this. Accordingly, his book abounds with directions which at first seem quite too obvious, and even commonplace to be needful to a teacher who has had the instruction and training to be assumed in the case of every teacher of "English" in American primary or secondary schools. These teachers will hardly need to learn from a book that "great care ought to be exercised in the selection of themes. . . . It is a good plan to allow pupils to select subjects with which they are familiar. . . . And, on the whole, it is an utter mistake to set school pupils to write homilies on the virtues and vices." Nevertheless, the minuteness of these suggestions, and the detailed accounts of methods followed with actual classes, will make the book valuable to many teachers who need line upon line of reproof, correction, and instruction in even the elements of righteousness.

The book contains, however, much else that will interest and help the American teacher of English. The treatment of conventional grammar, including historical grammar, oral composition, and phonetics, is new and sane. The chapter on "Thought-Analysis," including "*précis*-writing" and note-taking, is full of matter new to most American teachers. The author finds it difficult "to discuss with patience that species of literary vandalism which goes by the name of paraphrasing." Yet he holds his patience with extraordinary tenacity through fourteen pages of very excellent suggestions upon that species of literary performance.

There is a particularly good chapter on "Taste in Literature," in which the teacher is warned to see to it that "his methods may not mar the beneficent work which is going on without his help," in the case of boys and girls who have a "natural inherited taste for prose and poetry, who take a delight in reading," and who "come from homes where books are more or less plentiful, where the whole atmosphere fosters the growth of taste." Two other classes will demand attention: those who "under wise and sympathetic treatment can be made to enjoy and profit by the literature lessons, and who are also capable of being filled with a complete dislike for the whole subject if wrong methods are employed;" and "those stolid young barbarians who appear to have absolutely no interest in literary expression. . . . This is really the most interesting of the three classes, at least to the teacher who is not above revising his methods." With reference to the average pupil of these classes, the practical question is: "By what means can the teacher endow his pupils with a taste for literature which is worthy of the name? How can he set to work so that they will, at the end of the school life, turn with impatience from that which is unworthy or that which is merely weak or lacking in inspiration?" Twelve pages are devoted to answering these questions. They are well worth reading and re-reading.

Other chapters there are on "Complete Texts or Selections?" "Some Notes on Method," "Schemes of Work," "Correlation" (of geography and literature, history and literature, nature-study and literature, painting and literature), and "The Equipment of the Teacher of English." The book is interesting from beginning to end. It is, on the whole, a fresh contribution to the literature of its subject. The English teacher cannot afford to leave it out of his set of tools for work.

NATHANIEL BUTLER

UNIVERSITY OF CHICAGO



*Zur Geschichte. Proben von Darstellungen aus der deutschen Geschichte für Schule und Haus.* By WILLY SCHEELE. Leipzig und Berlin: Teubner, 1906.

Most of the German reading-material for schools is devoted to poetry, and yet there exist a great many historical and scientific German books where both contents and form are of classical value. Therefore teachers of German will be gratified by a new series of selected texts which is just going to be edited by the well-known publishing house of B. G. Teubner in Leipzig. The entire series is called "Aus deutscher Wissenschaft und Kunst" and will contain selections from famous German writers on political history, history of art, literature, and science. Scheele's selection contains samples of Mommsen, Lamprecht, von Treitschke, and others. The value of the book is increased by biographical notes and a short sketch of the development of historical writing in Germany.

A. C. VON NOÉ

UNIVERSITY OF CHICAGO

### BOOKS RECEIVED

(The notice here given does not preclude the publishing of a comprehensive review.)

#### EDUCATION

*Installation of Edmund Janes James, Ph.D., LL.D., as President of the University of Illinois.* University of Illinois Bulletin, Vol. III, No. 8, in 4 Parts. Each Part, \$1.

Part I. *Proceedings of the National Conference of College and University Trustees.*

Part II. *Proceedings of the Conference on Religious Education.*

Part III. *Proceedings of the Conference on Commercial Education.*

Part IV. *General Exercises of the Week, Including the Inaugural Address of President James.*

*Das Deutsche Bildungswesen in seiner geschichtlichen Entwicklung.* Von Friedrich Paulsen. Leipzig: B. G. Teubner, 1906. Pp. 2+192.

*Public Elementary School Curricula: A Comparative Study of Representative Cities of the United States, England, Germany and France.* By Bruce RYBURN PAYNE. New York: Silver, Burdett & Co., 1905.

*The Teachers' Bulletin.* Published Monthly by the University of Cincinnati. Series III, Vol. II (1906).

No. 1. *A Teacher's Manual for the Study of French.* By MARCO F. LIBERMA. Pp. 20.

No. 2. *A List of Experiments in Physics.* By LOUIS TRENCHARD MORE. Pp. 11.

No. 3. *Chemistry in the Secondary Schools.* By THOMAS EVANS. Pp. 16.

No. 4. *Field Notes in Nature Study, No. 5: The Organization of a Natural-History Club.* By HARRIS M. BENEDICT. Pp. 14.



These pamphlets are full of definite, practical suggestions for high-school teachers. A brief bibliography is usually included. Evidently intended for the guidance of teachers who are facing the problem of preparing students to meet the entrance requirements of the university, they are nevertheless likely to be of value to others in need of pedagogic direction. Professor Benedict's sensible remarks on the "Organization of a Natural History Club" can be commended to those who find a similar problem at hand. The previous volume of this series contains, in No. 6, "A Commentary on Materials Essential to the Teaching of Roman History," by George D. Hadzsits, an admirable statement of the aims and working tools of a teacher of this subject. Vol. I, No. 7, "Aids in the Teaching of History," by Merrick Whitcomb, and No. 8, "Illustrative Material for Greek and Roman History," by Lillian W. Thompson, also contain useful bibliographic information.

## HISTORY AND CIVICS

*Outlines of Ancient History.* By WILLIAM C. MOREY. New York: American Book Co., 1906. Pp. 550. \$1.50.

*Essentials of United States History.* By WILLIAM A. MOWRY. New York: Silver, Burdett & Co., 1906. Pp. 378+56.

*Elements of Political Science.* By STEPHEN LEACOCK. Boston: Houghton, Mifflin & Co., 1906. Pp. lx+417. \$1.75.

*Citizenship and the Schools.* By JEREMIAH W. JENKS. New York: Henry Holt & Co., 1906. Pp. x+264. \$1.25.

## LATIN

*The Elements of Latin.* By CLIFFORD H. MOORE and JOHN J. SLICHER. New York: D. Appleton & Co., 1906. Pp. 284.

*Beginning Latin.* By JOHN EDMUND BARSS. New York: University Press Co., 1906. Pp. 321. \$1.

## ENGLISH

*Little Stories of France.* By MAUDE BARROWS DUTTON (with Preface by SAMUEL T. DUTTON). New York: American Book Co., 1906. Pp. 176. \$0.40.

*The Action Primer.* By THOMAS O. BAKER. New York: American Book Co., 1906. Pp. 112.

*The Indian Primer.* By FLORENCE C. FOX. New York: American Book Co., 1906. Pp. 120.

*Playmates: A Primer.* By M. W. HALIBURTON. Atlanta: B. F. Johnson Publishing Co., 1906. Pp. 96.

## GERMAN

*Im Sonnenschein: Ein grünes Blatt.* Von THEODOR STORM. Edited by G. L. SWIGGETT. New York: American Book Co., 1906. Pp. 42+36.

## SCIENCE

*Forty Lessons in Physics.* By LYNN B. McMULLEN. New York: Henry Holt & Co., 1906. Pp. xviii + 452.

*Experimental Physiology and Anatomy.* By WALTER HOLLIS EDDY. New York: American Book Co., 1906. Pp. 112.

*Half Hours with Fishes, Reptiles and Birds.* By CHARLES FREDERICK HOLDER. New York: American Book Co., 1906. Pp. 255. \$0.90.

## MATHEMATICS

*Progressive Arithmetic.* First, Second, and Third Books. By WILLIAM J. MILNE. New York: American Book Co., 1906. Pp. 288, 284, and 348.

## MUSIC

*Natural Music Course.* Melodic First, Second, Third, and Fourth Readers. By FREDERIC H. RIPLEY and THOMAS TAPPER. New York: American Book Co., 1906. Pp. 128, 144, 192, and 256.

# PHYSIOLOGY

## THE COLTON SERIES

### ELEMENTARY PHYSIOLOGY AND HYGIENE

For grammar grades. 317 pages. Illustrated, price 60 cents.

### PHYSIOLOGY: BRIEFER COURSE

For high schools. 386 pages. Illustrated. Price 90 cents.

## NEW BOOKS IN THE COLTON SERIES

### PRACTICAL PHYSIOLOGY

A text for a laboratory course. 171 pages. Price 60 cents.

### PHYSIOLOGY: PRACTICAL AND DESCRIPTIVE

The Briefer Course and the Practical Physiology in one volume. 556 pages. Price \$1.40.

### GOOD HEALTH FOR GIRLS AND BOYS

By BERTHA M. BROWN, Instructor in Biology, State Normal School, Hyannis, Mass. 164 pages. Beautifully illustrated. Price 45 cents.

### COLTON'S PHYSIOLOGY AND HYGIENE

has recently been adopted as the basis of the State text-book of California.

SEND FOR A COMPLETE DESCRIPTION OF THESE BOOKS

**D. C. HEATH & COMPANY, Publishers**

BOSTON

NEW YORK

CHICAGO

LONDON

